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Chambers Creek Interceptor, Pierce County Washington. Draft Environmental Impact Statement Supplement

(U.S.) Environmental Protection Agency
Seattle, WA

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The development of a basinwide sewerage system for the Chambers Creek - Clover Creek area has been proceeding since 1969. During 1975 Pierce County, Washington and the U.S. Environmental Protection Agency prepared separate environmental impact statements for the Chambers Creek sewerage system. Since that time, the project as proposed in those documents proceeded in various stages of development. The design and construction of the main sewer interceptor into the treatment facility was to coincide with the design and construction schedule for the treatment plant. However, preliminary soil investigations revealed that the proposed interceptor route was unsuitable due to unstable soils conditions. Because of those findings, a tunneling alternative was suggested. This supplemental environmental impact statement examines the impacts associated with the new tunnel alternative.

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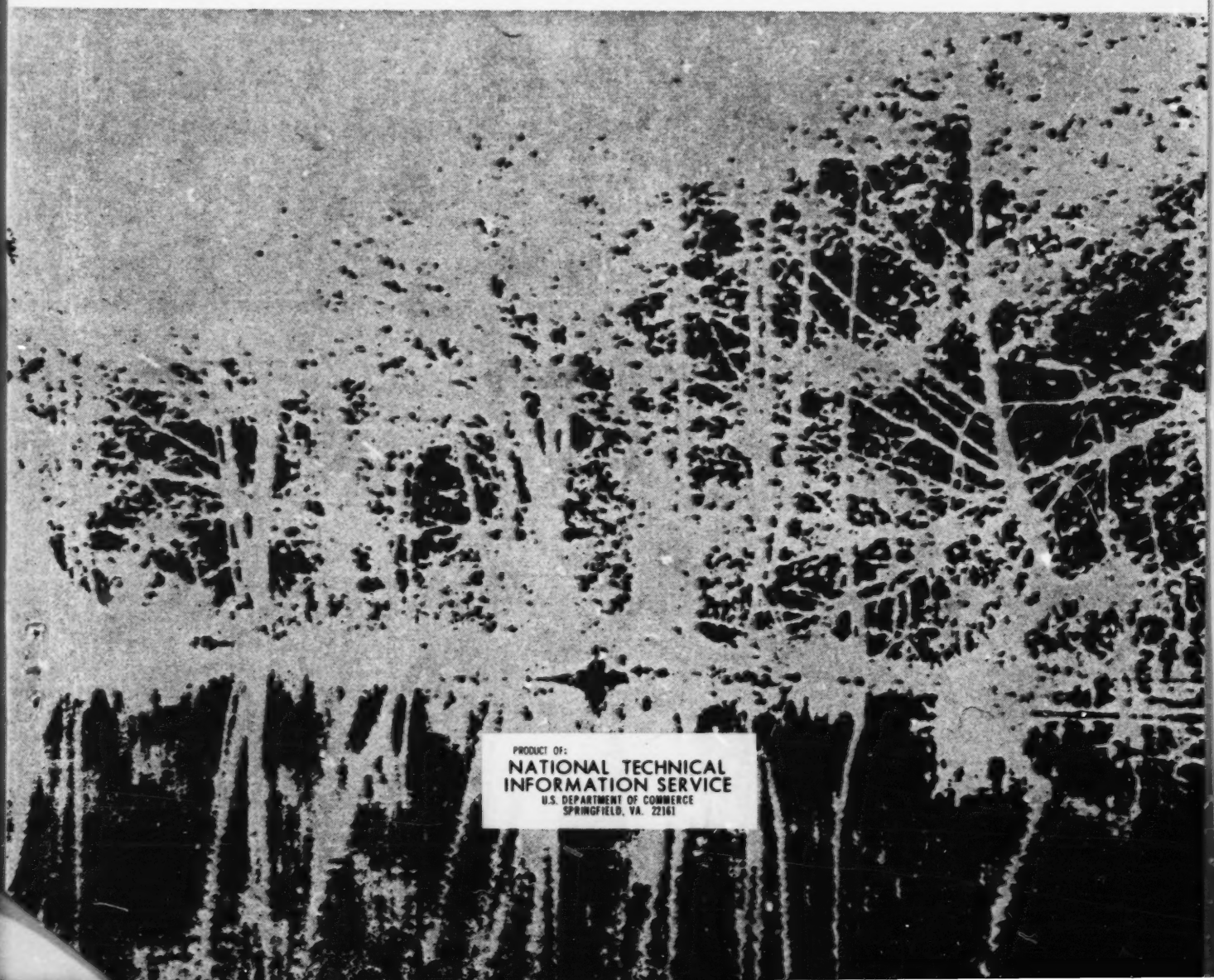
Chambers Creek Interceptor
Pierce County, Washington



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CHAMBERS CREEK INTERCEPTOR
PIERCE COUNTY, WASHINGTON

PREPARED BY

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON 98101

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Chapter 1

EXECUTIVE SUMMARY

Purpose and Need for Action

The development of a basinwide sewerage system for the Chambers Creek-Clover Creek area has been proceeding since 1969. During 1975, Pierce County, Washington and the U. S. Environmental Protection Agency (EPA) prepared separate Environmental Impact Statements (EISs) for the Chambers Creek sewerage system (ULID 73-1). The EPA's Final EIS determined that the project selected by the grantee (which included a proposed interceptor route along the North Wall of Chambers Creek Canyon) was the most cost-effective and environmentally-sound alternative. Although the facilities plan and the Final EIS included special mitigative measures addressing soil and slope stability, detailed soils information was unavailable. Since that time, the project as proposed in those documents proceeded in various stages of development; approximately 20 percent of the trunk and collection system has been or is under construction (Step III), and Phase I of the treatment plant at Chambers Creek is presently under construction. Phase II of the wastewater treatment plant is scheduled for construction beginning in June 1981.

The design and construction of the main sewage interceptor from Bridgeport Way to the treatment facility was to coincide with the design and construction schedule for the treatment plant; however, preliminary soil investigations revealed that the proposed interceptor route was unsuitable due to unstable soils conditions. Because of those findings, a tunneling alternative was suggested, and eventually considered in greater detail by the grant applicant.

As a result of the change in interceptor alignment, EPA informed Pierce County that a Supplemental Draft and Final EIS would be required. This Supplemental EIS is limited to the environmental impacts associated with the new Tunnel Alternative (and compared with no-action and the Pump Station Alternative considered in the 1975 EIS). All other environmental impacts were sufficiently analyzed in the 1975 Final EIS.

Project Study Area

The study area defined in the 1975 Final EIS included the Chambers Creek-Clover Creek drainage basin and the proposed Stage I and Stage II sewer service areas (Figure 1-1). Due to the limited scope of this Supplemental EIS, the study area will only include the proposed interceptor alignments and the areas immediately affected by the project alternatives (Figure 1-1).

Project Alternatives and Summary of Impacts

Two project alternatives (Pump Station Alternative and Tunnel Alternative) plus the No-Action Alternative are examined in this EIS. The Pump Station Alternative was analyzed as a feasible alternative in the 1975 Final EIS (it was defined therein as Alternative Interceptor Route 3). The Tunnel Alternative was developed as a result of soils investigations of the originally preferred alignment.

Pump Station Alternative

The Pump Station Alternative would transport wastewater from a pump station near Bridgeport Way, through a 4,000-foot-long force main and 10,000-foot-long gravity pipeline located in Chambers Creek Road, to the sewage treatment plant near the mouth of Chambers Creek. All but 1,200 feet of the alignment would be within the existing Chambers Creek Road right-of-way. Sewage flows would enter the interceptor at the pump station and at two points along Chambers Creek Road.

The major environmental impacts associated with construction of this alternative are shown in Table 1-1. A number of mitigation measures to avoid or reduce the severity of the adverse impacts are possible. These would include the following:

- Immediately backfill open-cut construction and repave to reduce impacts on surface water quality.
- Prepare a traffic management plan for traffic diversion and control. The plan should indicate the alternative routes during construction and the means of informing the public of the availability and location of the routes.
- Provide gravelled access road for local use during construction.

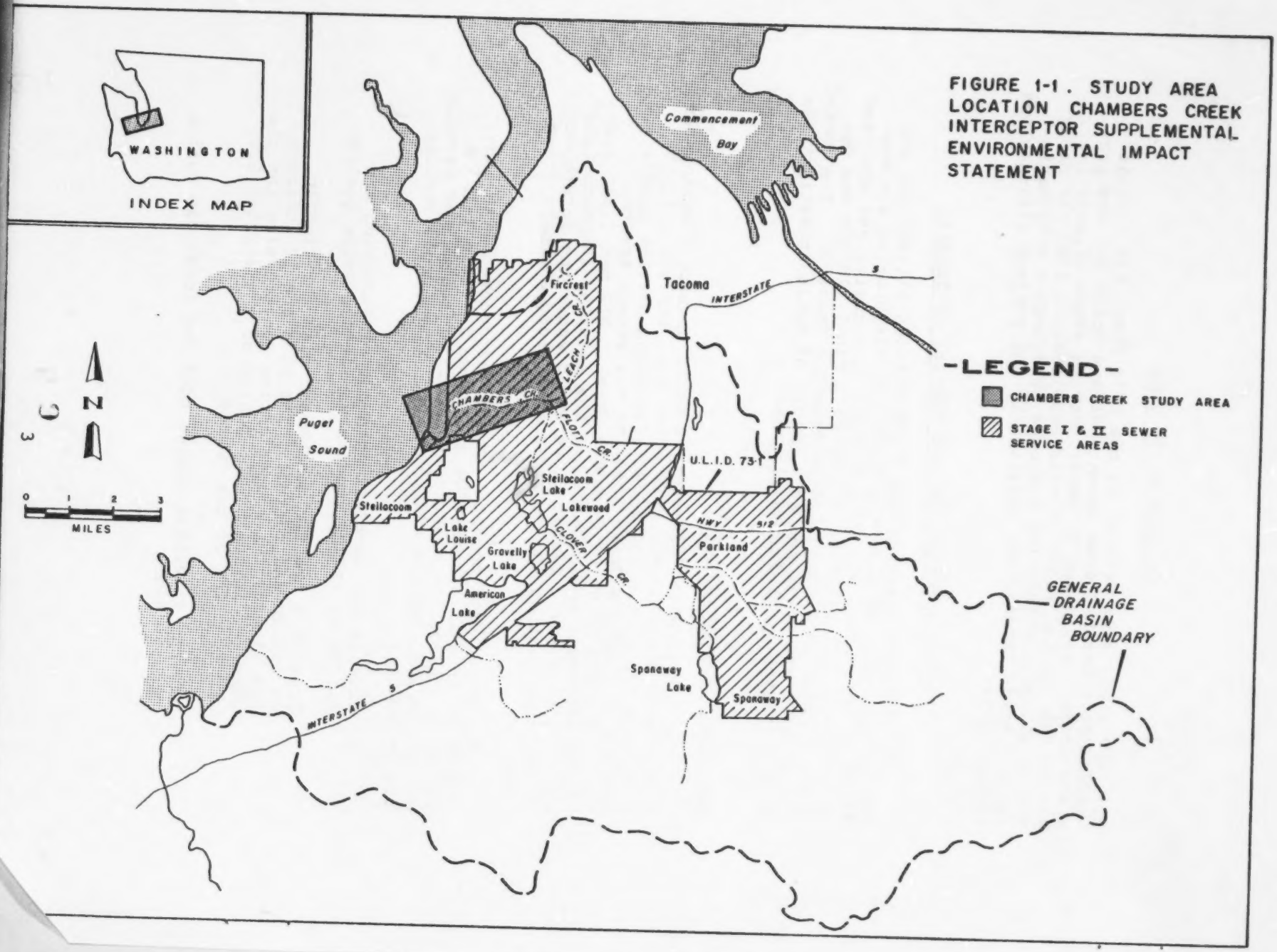

FIGURE 1-1. STUDY AREA LOCATION CHAMBERS CREEK INTERCEPTOR SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Table 1-1. Summary of Environmental Impacts of the Project Alternatives

Economic Factors	Pump Station Alternative	Tunnel Alternative With Concrete Liner (Polyethylene Liner)	No-Action
o Construction cost	$11,407,000	$14,500,000 ($16,307,100)	
o Present worth	$14,473,600	$12,997,400 ($14,162,200)	
o Annual operation and maintenance	$ 199,800	$ 36,000 (2,500)	
o Total length	15,800 feet	14,700 feet	
- Length open-cut/(tunnel)	15,800 ft/(0)	1,925 feet/(12,775 feet)	
Environmental Resource Factors			
- Groundwater	None	Possibly affect water levels in local wells	Possible contamination from septic systems
- Soils and ground stability	Possible soil stability problems on lower Chambers Creek Road	Minor if proper construction methods used	None
- Surface water	Minor impact during construction	Nonexistent	None
- Terrestrial and aquatic resources	None	None	
- Spoil disposal (quantity excavated)	Minor impact (15,400 cy)	Minor impact (26,900 cy*)	None
- Transportation, traffic circulation and utilities	Severe-reroute traffic	Minor	None
- Noise - long term	Pump station operation - 41-46 dBA	None	None
- Noise - construction	65-80 dBA - localized during construction	Minor-localized	None
- Land use - construction	Access impeded	None	None
- Land use - long term	None	None**	None
- Business disruption - construction	Access to 5 or 6 businesses restricted	None	None
- Energy consumption	6.2 million kwhr/yr; 10,000 gal/ fuel/year	None	None
- Duration of construction (weeks)	63-126 weeks	65-73 weeks	

*This quantity of material assumes construction of a 102-inch diameter tunnel.

**Permanent subsurface easements would be required along approximately 37 percent of the alignment but would not adversely affect long-term land use.

- o Allow local access during off-construction hours.
- o Forewarn the fire department of any construction that would affect access.
- o Employ noise controls on construction equipment.

Tunnel Alternative

The Tunnel Alternative would transport sewage from an inlet structure near Bridgeport Way through a 12,800-foot tunnel to the sewage treatment plant near the mouth of Chambers Creek. Approximately 54 percent of the alignment would be located on county-owned property, while the remaining 46 percent would traverse private ownership. The tunnel would range from 25-150 feet below the surface. The major impacts of constructing this alternative are shown in Table 1-1. The following measures could be taken by the county to gain a better understanding of hydrogeological conditions along the alignment.

- o Inventory local wells and developed springs along the tunnel alignment using parameters recommended in Appendix B of this EIS.
- o Conduct additional soil test borings with multiple piezometers to determine potentiometric surfaces, hydraulic gradients and seasonal water level fluctuations.
- o Determine hydraulic continuity of upper and lower aquifers for those areas which might require dewatering.

No-Action Alternative

The No-Action Alternative was analyzed in EPA's 1975 Final EIS. For purposes of this Supplemental EIS, the No-Action Alternative would include a decision not to proceed with final design and construction of the main interceptor.

The main impact associated with the No-Action Alternative would be the loss of funds and materials expended to date on planning, design, and construction of the sewage facilities. Groundwater resources would continue to be degraded by failing subsurface disposal systems and the possibility would exist of additional construction bans by the DOE.

Alternatives Available to EPA

EPA may develop other structural alternatives or administrative alternatives as a part of its EISs on wastewater facilities plans. In the case of this Draft Supplemental EIS, EPA has determined that Pierce County has examined a full range of structural alternatives, and that analysis of others is not warranted.

As administrative alternatives, EPA may decide to fund or not fund the selected alternative or to fund the project in stages. EPA may also place grant conditions on subsequent design and construction in order to mitigate adverse impacts.

Wastewater Flows

The proposed Chambers Creek wastewater treatment plant would be designed to handle a year 2000 accumulated peak wet weather flow of approximately 60.35 MGD. Construction of the facilities would be staged during the 20-year planning period (see Figure 1-1).

The Pump Station Alternative would be designed to handle wastewater flows of 55.54 MGD at the pump station and approximately 59.42 MGD within the gravity portion of the interceptor.

The Tunnel Alternative would handle flows of 55.54 MGD at the inlet point on Bridgeport Way, and flows of 59.42 MGD where flows from University Place South and Westside Sewer District would enter the system.

Approximately 0.93 MGD of wastewater from Westside Oakbrook would not enter either the Pump Station Interceptor or the tunnel, but would instead enter the Chambers Creek treatment plant via a separate interceptor system.

Conclusions

The following conclusions can be made relative to the alternatives considered in this EIS:

- Construction of the Pump Station Alternative would adversely affect local transportation, access, and commercial enterprises located on or utilizing Chambers Creek Road.

- Construction costs of the Pump Station Alternative would be $11.4 million vs. $14.5-$16.3 million for

the Tunnel Alternative; however, the annual operation and maintenance costs for the Pump Station Alternative would be $164,000-$197,000 greater than for the Tunnel Alternative.

- Present worth costs of the Pump Station Alternative would be $14.5 million vs. $13.0-$14.2 million for the Tunnel Alternative.

- Annual energy costs for the Pump Station Alternative to the year 2000 may range from $63,500-$223,800 per year, depending on the energy escalation rate. No annual energy costs would be associated with the Tunnel Alternative. This is a significant difference in light of projected energy demand in the northwest.

- Based on existing data, dewatering associated with the Tunnel Alternative has the potential to adversely affect individual water supplies. Proper preconstruction surveys and construction methodology would minimize this risk. With proper mitigation, the risk would not be worth the trade-off of the higher energy consumption and operation and maintenance costs associated with the Pump Station Alternative.

Availability of Support Documents

A large number of reports are related to this Supplemental EIS. Those support documents, the 1976 EIS prepared by EPA, the 1976 EIS prepared by Pierce County, the Cost Effective Analysis of the Chambers Creek Interceptor Alternatives prepared by Kennedy Engineers, plus the earlier Chambers Creek-Clover Creek Basin Sewerage Management Plan (1969) and Chambers Creek Basin Water Quality Management Plan (1974), are available for public review at the following location:

Pierce County Public Works Department-
Office of Utilities
3551 Bridgeport Way W.
Tacoma, WA 98466

Review Period and Public Hearing

Agencies, public groups and citizens wishing to comment on this Draft EIS may submit written comments prior to 1981. EPA will conduct a public hearing on the Draft EIS at 7:00 p.m. on 31 MAR 1981 in the:

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Chambers of the Board of Pierce County Commissioners
County-City Building, Room 1046
930 Tacoma Avenue
Tacoma, WA 98402

All interested citizens are invited to attend. All comments received will be given consideration before EPA makes a decision on providing funding to the county for design and construction of the proposed facilities.

Chapter 2

EXISTING AND PROPOSED WASTEWATER INTERCEPTOR FACILITIES

Introduction and Project Background

Since 1968, Pierce County has been involved in a planning effort to provide a sewerage system for the Chambers Creek-Clover Creek drainage basin. A sewerage general plan which defined project alternatives and recommended a plan of action, was approved in 1969 and was followed by the Chambers Creek Basin Water Quality Management Plan in 1974. Both documents recommended a basinwide collection system, an interceptor at the bottom of Chambers Creek Canyon and a treatment plant on a site to be purchased from the Glacier Sand and Gravel property near the mouth of Chambers Creek.

In the EIS prepared in 1975 by Pierce County and EPA, the recommended interceptor alignment was changed from the bottom of Chambers Creek Canyon to a route high on the North Wall of Chambers Creek Canyon. That alignment was chosen to minimize the impact of constructing close to Chambers Creek.

Following completion of EPA's Final EIS, preliminary design (Step II) of the sewerage system was begun in early 1976, and a soils reconnaissance study commenced in December 1976. The chronological events leading from the preliminary design were as follows:

- February 1977 - Completion of preliminary soils reconnaissance study by Hart-Crowser & Associates entitled Engineering and Geological Reconnaissance, Proposed Chambers Creek Interceptor System, Pierce County, Washington. That report indicated considerable slope instability along much of the proposed North Canyon Wall alignment and that "higher than normal construction costs ... should be anticipated ...". The report recommended additional subsurface investigations and consideration of tunneling as an alternative.

- Early 1977 - Kennedy Engineers began an investigation of tunnel feasibility for the Chambers Creek Interceptor.

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- June 1977 - Hart-Crowser & Associates prepared a report on an additional subsurface study entitled Preliminary Soils and Foundation Investigation, Proposed Chambers Creek Interceptor System, Pierce County, Washington.

- March 1978 - Kennedy Engineers prepared Chambers Creek Interceptor Feasibility Study, Pierce County, Washington. The report showed only a small difference in cost between the tunnel and North Canyon Wall and considerably less environmental impact with the Tunnel Alternative. The North Canyon Wall Alternative was dropped from further consideration.

- April 1978 - Pierce County commissioners authorized Kennedy Engineers to proceed with design of the Tunnel Alternative.

- June 1979 - Hart-Crowser & Associates prepared Phase I Geotechnical Engineering Study, Proposed Chambers Creek Interceptor Tunnel, Pierce County, Washington. The report concluded that construction of the tunnel is feasible and that additional soil exploration is needed.

- March 1980 - Hart-Crowser & Associates completed additional soils study and a Preliminary Report on Phase II Geotechnical Engineering Study and Recommendations for Phase III and IV Investigations, Proposed Chambers Creek Interceptor Tunnel, Pierce County, Washington. The report concluded the feasibility of the tunnel as good, with some special construction techniques suggested. Two additional phases of soil exploration were recommended. The Phase III investigations are scheduled to be completed near the end of March 1981, while Phase IV work would not be completed until September 1981. The Phase III report is to finalize the exact tunnel alignment and to better define groundwater conditions at the east and west ends of the alignment. Phase IV work would constitute additional soil borings at approximately 200-foot intervals.

- July 1980 - Kennedy Engineers prepared Cost Effective Analysis of the Chambers Creek Interceptor Alternatives, Pierce County, Washington which compared the costs of the Tunnel and Pump Station Alternatives. The Tunnel Alternative was found to be the most cost-effective.

Because of the significant changes in the originally preferred alternative (1975 EIS), EPA determined that a Supplemental EIS was needed, and on November 25, 1980, initiated the procedure to prepare this report.

Description of Existing System

A detailed description of the existing systems of sewage treatment and disposal was presented in the Chambers Creek-Clover Creek Basin Sewerage General Plan, Pierce County, Washington (1969), and the Chambers Creek Basin Water Quality Management Plan for Pierce County, Washington (1974) prepared by Kennedy Engineers, and in the Final Environmental Impact Statement for Chambers Creek System (ULID 73-1) (1975) prepared by EPA.

The overall plan for sewage collection, treatment and disposal in the Chambers Creek-Clover Creek Basin, as defined in the earlier studies, would consist of the following components:

- A collection and interceptor system constructed in two stages. The Stage I service area would include the ULID 73-1, the Town of Steilacoom and the Westside Water District. Stage 2 expansion would provide sewer service to the Fircrest portions of University Place, Tillicum, American Lake Gardens and the remaining portions of Parkland and Spanaway.

- A treatment plant located just north of Chambers Creek, on property owned by the Glacier Sand and Gravel Co. The treatment facilities would include secondary treatment for a year 2000 design flow of 38.69 MGD peak dry weather flows (accumulated) and 60.35 MGD peak wet weather flows (accumulated).

- An outfall discharging 600 feet offshore into Puget Sound to a depth of 130 feet.

- A plan for sludge disposal which would include anaerobic digestion, chemical conditioning, vacuum filtration with ultimate disposal at the Pierce County sanitary landfill.

- A main sewer interceptor from Bridgeport Way to the Chambers Creek treatment plant, the subject of this Supplemental EIS.

All features of the project proposed in those documents, except for the main interceptor from Bridgeport Way to the treatment plant (the subject of this EIS) are in final design (Step II) or under construction (Step III). To date, approximately 20 percent of the trunk and collector sewer system has been or is under construction (Tonkin pers. comm.).

Chambers Creek Interceptor Alternatives

As previously mentioned, the earlier facilities plan and EISs defined and evaluated a number of alternative alignments from Bridgeport Way to the treatment plant. Those previous alternatives and those now being considered are presented herein.

Alternatives Previously Considered

Three alternative interceptor alignments were evaluated in the 1975 EPA Final EIS. These were:

- The "original alignment closely paralleling Chambers Creek at the bottom of the Canyon. This alignment was eliminated because of the major environmental impacts caused by construction and because of likely conflict with the objectives of the Washington Shoreline Management Plan.

- An alignment higher on the North Wall of Chambers Creek Canyon. This was the preferred alternative in the 1975 EIS and, at that time, the alignment proposed by the grant applicant. This alternative has since been eliminated because of hazards of constructing the alignment on the steep Canyon wall (see Introduction and Background for more detail).

- The Pump Station Alternative (combination force main and gravity interceptor) within Chambers Creek Road, from Bridgeport Way to the treatment plant. At the time of the 1975 EIS, this alternative was eliminated because of the impact of construction on traffic on Chambers Creek Road and because of the higher annual operation and maintenance costs associated with pumping.

In addition to the aforementioned alternatives, an analysis of the "No-Action" Alternative was made in the 1975 EIS.

Project Alternatives

For the purposes of this Supplemental EIS, the "No-Action" Alternative and two interceptor alternatives are considered: the Pump Station Alternative and the Tunnel Alternative.

No-Action Alternative. Federal Regulations (40 CFR Part 6) require consideration of the No-Action Alternative in all EISs. For purposes of this Supplemental EIS, the no-action option would include a decision not to proceed with final design and construction of the main interceptor and appurtenant facilities. The No-Action Alternative was considered in the 1975 EIS and will only be briefly discussed here.

In 1971, the Washington State Department of Ecology (DOE) imposed a ban on the construction of subsurface disposal systems in the Chambers Creek-Clover Creek basin due to continuing evidence of wastewater disposal and water quality problems (EPA 1975). Once DOE had received evidence that Pierce County was to embark on a staged program for sewage collection and treatment, the earlier order was rescinded and a prescribed number of building permits were allowed (DOE Docket No. DE 73-172). It is possible that DOE would reimpose some combination of the earlier docket in the event the No-Action Alternative was pursued.

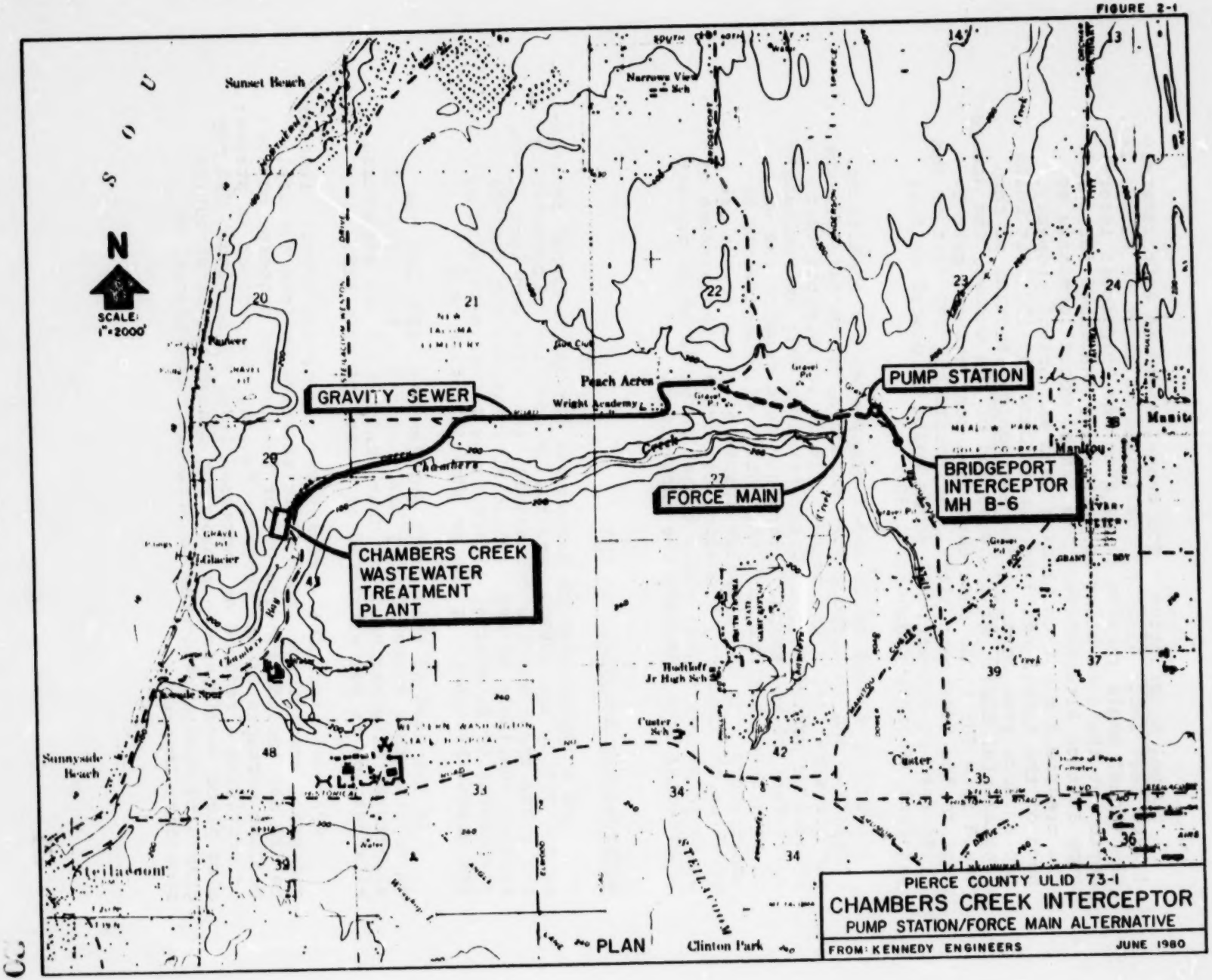
Pump Station Alternative. This alternative was previously considered in the 1975 EIS but eliminated at that time for the reasons previously mentioned. This alternative is being reconsidered herein because it remains a viable alternative and can be evaluated and compared to the Tunnel Alternative, whereas the other alternatives considered in 1975 are essentially infeasible due to major construction, environmental or institutional concerns.

A detailed description of the Pump Station Alternative is presented in the Cost Effective Analysis of the Chambers Creek Interceptor Alternatives prepared by Kennedy Engineers (1980), and only a brief description will be presented here.

The Pump Station Alternative would include a large pump station located in an abandoned gravel pit on the north side of Bridgeport Way just north of Leach Creek (Figure 2-1). The pump station would receive flows from the Bridgeport gravity interceptor, and would eventually receive flows from areas served in the future by the Leach Creek and University Place east interceptors (Kennedy Engineers 1980).

Flows from the pump station would first enter a 4,000-foot-long, 42-inch-diameter force main and then a 10,000-foot-long gravity interceptor (42-60 inch diameter pipe) to the sewage treatment plant (see Figure 2-1). All but 1,200 feet of the alignment would be within the existing Chambers Creek Road right-of-way. A 230-foot section of the interceptor would be jacked through a 60-foot-high ridge between Chambers Creek Road and the treatment plant site. Construction for all but the 230 feet of this alternative would be by open-cut trenching.

FIGURE 2-1



PIERCE COUNTY ULID 73-1

CHAMBERS CREEK INTERCEPTOR

PUMP STATION/FORCE MAIN ALTERNATIVE

FROM: KENNEDY ENGINEERS JUNE 1980

Tunnel Alternative. The tunnel would be approximately 12,800 feet long following the alignment shown on Figure 2-2. The tunnel would receive flows from the Bridgeport interceptor at the same point as previously described for the Pump Station Alternative. The tunnel would terminate at the treatment plant on Glacier Sand and Gravel property. Much of the tunnel would be constructed 100-150 feet below the surface (see Construction Methodology section of this Supplemental EIS). At the west end of the tunnel, the sewage would flow for 1,250 feet through a conventional gravity pipe to the treatment plant. Approximately 800 feet of the 1,250 feet of conventional sewer would be placed on fill material (Kennedy Engineers 1980).

For any tunnel built under compressed air conditions, a bulkhead and an airlock must be installed to maintain the air pressure inside the tunnel. It is anticipated that because of possible groundwater problems only approximately 2,200 feet of the tunnel alignment would require the use of compressed air but that the entire alignment would be constructed with the pressure system in place or the use of an earth balancing tunneling technique. The purpose of using these techniques while tunneling would be to prevent groundwater from entering the excavation.

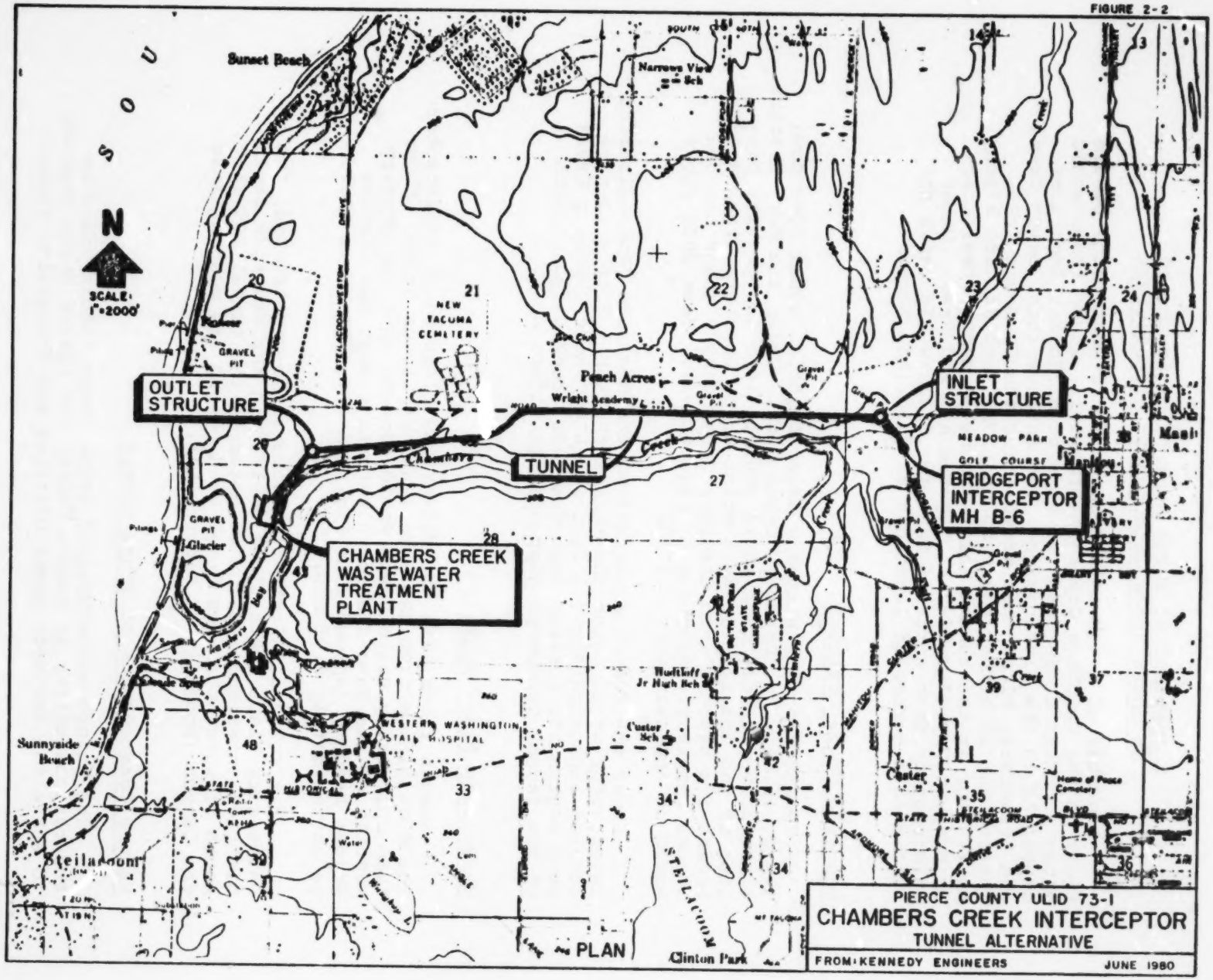
Alternatives Available to EPA

EPA's implementation procedures for the National Environmental Policy Act (NEPA) require, in addition to considering the grant applicant's alternatives, that EISs consider alternatives available to EPA. These alternatives may include structural or locational alternatives not investigated by the grant applicant, or can be administrative only.

In the case of this Draft Supplemental EIS, EPA has determined that Pierce County has examined a full range of structural alternatives, and that analysis of new structural alternatives is not warranted as a part of this EIS.

EPA administrative alternatives are of two types: funding and grant conditions. Such administrative options available to EPA may include funding or not funding the proposed action; funding portions of the project; funding the project in stages; or providing a reduced or increased level of funding. EPA may also place conditions on subsequent design and construction grants to mitigate adverse construction, operational or secondary impacts.

FIGURE 2-2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CHAMBERS CREEK WASTEWATER TREATMENT PLANT
Sunset Beach
Peach Acres
Wright Academy
NEW TACOMA CEMETERY
MEADOW PARK GOLF COURSE
Sunnyside Beach
WESTERN WASHINGTON STATE HOSPITAL
Steilacoom
Custer
Clinton Park
PLAN
PIERCE COUNTY ULID 73-1
CHAMBERS CREEK INTERCEPTOR
TUNNEL ALTERNATIVE
FROM: KENNEDY ENGINEERS
JUNE 1980

Connection of North Area Trunk Sewers to Chambers Creek Interceptor Alternatives

A number of trunk interceptors would contribute sewage flows to the Chambers Creek Interceptor. These flows would enter the main interceptor at several different locations, depending on the alternative. Two interceptors, Leach Creek and University Place East would enter the Chambers Creek Interceptor at either the pump station (Pump Station Alternative) or at the tunnel inlet (Tunnel Alternatives) near Bridgeport Way (Appendix A; Figures A-3 and A-4). Other interceptors from north of Chambers Creek would enter the system at a number of locations as described herein.

Westside Sewer District

Sewage from the Westside Sewer District would flow down Grandview Drive to Chambers Creek Road. Under the Pump Station Alternative the district would connect into the gravity portion of the interceptor at a point where Chambers Creek Road begins its descent into Chambers Creek Canyon (near the new Tacoma cemetery) (Appendix A; Figure A-3). Year 2000 flows would be approximately 3.8 MGD.

Under the Tunnel Alternative, the Westside Sewer District Interceptor would enter the tunnel through a drop structure located approximately 300 feet south of where Chambers Creek Road begins its descent into Chambers Creek Canyon (south of New Tacoma Cemetery) (Appendix A; Figure A-4).

University Place South

Sewage flows from the University Place South Interceptor would originate from the area south of Cirque Drive. Flows from University Place South would connect into the gravity portion of the Pump Station Alternative near the Charles Wright Academy (Appendix A; Figure A-3). The flows would be approximately 0.95 MGD.

If the Tunnel Alternative were to be constructed, the University Place South flows would join the Westside Sewer District interceptor prior to entering the tunnel 300 feet south of where Chambers Creek Road begins its descent into the Canyon (Appendix A; Figure A-4).

Future Construction of Trunk Sewers

The future connection of trunk interceptors would be the responsibility of Pierce County and future ULIDs created to serve the Westside Sewer District and University Place.

The exact alignments of the trunk sewers and impacts associated with each would be contingent upon the interceptor selected, the Pump Station Alternative or the Tunnel Alternative.

No matter which interceptor is chosen, some future construction will occur along Chambers Creek Road. Impacts on Chambers Creek Road associated with construction of the Pump Station Alternative are presented in Chapter 3 of this EIS. Construction of the Tunnel Alternative would avoid Chambers Creek Road, yet the construction of the University Place South and Westside Sewer District trunk sewers, as now defined, would ultimately require some construction within the roadway. The Westside Sewer District Interceptor is presented being designed (Step II), with funding of the system scheduled for 1984 (Carroll pers. comm.).

Design Flows

The year 2000 peak wet weather flows projected for the entire Stage I and Stage II service areas would be 60.35 MGD (Kennedy Engineers 1980). The Pump Station Alternative would receive approximately 59.42 MGD of those flows, while the Tunnel Alternative would handle 55.54 MGD (Table 2-1).

The Pump Station Alternative would handle all flows from the service areas except for 1.51 MGD from the Westside Oakbrook Interceptor, which would directly enter the Chambers Creek wastewater treatment plant from the south (see Appendix A; Figure A-3).

The Tunnel Alternative would handle all service areas flows except for Westside Oakbrook (1.51 MGD), Westside Sewer District (3.78 MGD), and University Place South (1.39 MGD) (see Appendix A; Figure A-4). Those flows would enter the Chambers Creek treatment plant via separate interceptors as discussed in the previous section.

Proposed Construction Methodology

Because the primary differences between the two "action" alternatives will involve construction, a brief description of proposed construction methodology is provided here.

Two types of construction are being considered: open-cut trenching (conventional construction) for the Pump Station Alternative and tunneling for the Tunnel Alternative.

Table 2-1. Year 2000 Design Flows

Trunk	ADWF mgd	Accumulated ADWF mgd	PDWF mgd	Accumulated PDWF mgd	PWWF mgd	Accumulated PWWF[1] mgd
Flows tributary to tunnel and pump station:						
Bridgeport Interceptor	12.99		25.26		39.92	
		12.99		25.26		39.92
Phillips-Hipkins Int.	4.10		9.13		11.88	
		17.09		32.74		50.15
Leach Creek Trunk	1.61		4.06		5.95	
		18.70		35.61		54.92
A. Fircrest/Tacoma	1.02		2.89		3.99	
		--		--		--
B. Pierce County	0.59		1.77		2.56	
		--		--		--
University Place East	0.18		0.66		0.95	
Total		18.88		35.44		55.54
Flows tributary to treatment plant:						
University Place South	0.29		0.97		1.39	
		19.17		36.45		56.47
Westside Sewer District	0.95		2.59		3.78	
		20.12		38.21		59.42
Westside Oakbrook	0.32		1.06		1.51	
Total		20.44		38.69		60.35

[1]The accumulated peak wet weather flow (PWWF) is derived by adding the average dry weather flows (ADWF) and multiplying that accumulated number by the peak factor from the 1969 peak factor curve to get the accumulated Peak Dry Weather Flow (PDWF). Accumulated inflow and infiltration amounts are then added to the accumulated PDWF to get the accumulated PWWF.

SOURCE: Kennedy Engineers 1980.

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Open-Cut Construction

Open-cut construction would involve the excavation of an open trench along the 15,800-foot-long alignment, the depth and width of which would vary with topography.

Along the force main portion of the alignment, the trench will be relatively shallow (8-10 feet) and approximately 6-8 feet in width at the bottom. Along portions of the gravity alignment, excavation of wide, deep trenches (20-25 feet) would be necessary (see the profile in Figure A-1 in Appendix A). Because of the extreme depth of the cut and the loose nature of the soil, virtually the entire width of the roadway would be necessary for construction. The top of the trench would be up to 60 feet wide.

It is anticipated that construction would progress at a rate varying from 25-50 feet per day. At that rate, construction would take 316-632 working days (63-126 weeks). Wherever deep cuts are needed, construction progress would be greatly reduced. Normally a maximum of 150-200 feet of trench would be open at any one time.

The normal equipment for construction would include a backhoe, front-end loader, several dump trucks, support equipment such as compressors, jackhammers, pumps and other miscellaneous tools. The standard procedure for construction would involve a backhoe and trucks excavating a trench 150-200 feet in length, followed by the pipe-laying crew using trench boxes or solder or sheet piling (whenever the trench is quite deep or soil is loose). Since the depth to groundwater along the alignment is 60-75 feet, no dewatering of the trench is anticipated.

Prior to installation of the pipe, a bedding material (i.e., sand or gravel) would be placed and compacted within the trench. The pipe would then be laid, and the trench backfilled and compacted. Excess material from the trench would be trucked to disposal sites. It is estimated that approximately 15,400 cubic yards of excess soil material would be excavated and would require disposal.

Tunnel Construction

A detailed analysis of proposed tunnel construction by Jacobs Associates was presented in the Cost Effective Analysis of the Chambers Creek Interceptor Alternatives prepared by Kennedy Engineers (1980); therefore, only a brief discussion of construction methodology will be presented here. A profile of the proposed Tunnel Alternative is shown on Figure A-2 in Appendix A.

Tunnel construction would involve the following basic features:

- Staging Areas - The staging sites would be established at the outlet of the tunnel and would consist of an area of approximately 3-4 acres. This area would support the equipment and material necessary for tunnel construction. The staging area would be on the Glacier Sand and Gravel property. A smaller staging area would also be necessary at the tunnel portal near Bridgeport Way.

- Pneumatic Systems - The tunnel will be designed to operate under a "low" pressure system if needed. To supply those needs, several large mobile and emergency compressors would be required. "High" pressure equipment such as drills, jackhammers, wrenches, etc., may be necessary during construction. This high air may be supplied by another compressor or off the low air system when such a system is used.

- Ventilation - The tunnel must be supplied with ventilation to serve the requirements of the men, and to remove heat loads generated by power equipment. The air supply will be provided by fans mounted at the entrance portal and at an intermediate surface location along the alignment. Booster fans transfer the air within the tunnel alignment.

- Transportation - The tunnel transport system will consist of a small scale electric railway for carrying men, support materials, tools, and equipment parts and the tunnel lining materials. It will also carry excavated material to the tunnel entrance.

- Tunnel Boring - Construction of the tunnel would involve the use of a boring machine with a tunnel shield. The shield would be forced ahead in steps, keeping pace with the progress of excavation and erection of tunnel support system behind. The tunnel diameter would range in size from 72-102 inches. The tunnel would probably be mined from Glacier Sand and Gravel upgrade to the tunnel portal at Bridgeport Way west. Blasting would not be required except in rare situations where a very large boulder is encountered (Douglas pers. comm.).

- Mucking and Spoil Disposal - Material excavated from the tunnel would be transported from the tunnel by small scale railway and conveyed from the entrance to the Glacier Sand and Gravel facility for disposal. The volume of material would range from 13,400 cubic yards for a 72-inch tunnel to 27,000 cubic yards for a 102-inch tunnel.

- Timing of Construction - The estimate of tunnel construction time, including excavation, concreting, grouting and cleanup would be 15-17 months. Under good working conditions, the tunnel excavation would proceed at about 100 linear feet per day.

Preferred Action Proposed by Pierce County

Although no alternative has been officially adopted by Pierce County, the Tunnel Alternative represents the preferred alignment based on the earlier review of the Cost Effective Analysis of the Chambers Creek Interceptor Alternatives prepared by Kennedy Engineers (1980).

The final decision by the Pierce County Board of Commissioners will be made at the conclusion of the EIS and the Phase III soils investigations and upon the recommendation of the design engineer (Peterson pers. comm.).

Chapter 3

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

Introduction

This chapter of the Supplemental EIS discusses the major environmental issues associated with construction of the alternative interceptor alignments. Each subsection deals with an individual issue. The issue is identified, pertinent background data are presented or cited and the nature of the impact of each alternative is discussed. Mitigation measures are suggested where significant adverse environmental impacts have been identified.

As mentioned previously, most of the impacts associated with the alternatives are construction-related, and tend to be of a short-term nature (during and shortly after construction).

Groundwater

Present Conditions and Use of Resources

An extensive discussion of the groundwater resources was presented in the 1975 EPA Final Environmental Impact Statement for the Chambers Creek Sewerage System and in the Chambers Creek/U.L.I.D. 73-1 Environmental Impact Statement prepared by Pierce County (1975). A comprehensive study of groundwater in central Pierce County and the Chambers Creek basin is described in the Washington Department of Water Resources Supply Bulletin No. 22 (1968).

Much of the surface soils within the study area consist of Steilacoom sand and gravels of high permeability, usually underlain by a layer or layers of more compacted material which has low permeability. Below the compacted sand-silt layer is the Kitsap formation which contains the deep aquifer. The compacted silts and sands occur in irregular, thin or discontinuous formations, which may allow integration of the shallow and deep aquifers, although the hydraulic relationship between the two aquifers is not clearly understood (Appendix B).

Within the Chambers Creek study area, groundwater occurs at depths ranging from 60-75 feet of the surface. Detailed soils studies conducted by Robinson, Noble & Carr, Inc., show groundwater in the lower aquifer to occur at 110-140-foot depths along the proposed tunnel alignment. Groundwater movement trends west-southwest in the area north of Chambers Creek Canyon, and almost due west along the Leach Creek drainage (EPA 1975).

Numerous private wells exist within the study area. Water from these local wells is withdrawn from both the upper and lower aquifers. For a more detailed analysis of existing groundwater conditions see Appendix B of this report.

Impact of the Alternatives on Groundwater

No-Action. The impact analysis on groundwater for the No-Action Alternative was presented in EPA's Final EIS (page 96). Since no construction would occur, short-term impacts would be nonexistent. The Final EIS indicated that the long term impact on groundwater of continued use of septic systems or their increased use would be difficult to predict, but that the filtering and purifying capacity of Steilacoom gravels is suspect. Failing septic systems and cesspools do exist, thereby contaminating upper groundwater. In turn, the deep aquifer may be receiving some contamination from the surface groundwaters.

Pump Station Alternative. Barring rupture of the force main or gravity line, the Pump Station Alternative should have no effect on groundwater in the Chambers Creek area (see Appendix B). Groundwater lies well below the proposed depth of the open-cut trench.

Tunnel Alternative. The construction of the tunnel alignment could possibly create an adverse impact on groundwater in the Chambers Creek area. The proposed tunnel would be driven below the upper aquifer for 75 percent of the length of the alignment but intruded into the lower aquifer (regional water table) for at least 7,000 feet in the central portion of its length. Extant information is not sufficient at this time to define aquifer conditions at both ends of the alignment. The potential groundwater-related impacts associated with boring the tunnel are as follows:

- Likelihood of Encountering Fine Sand Layers - Pockets of fine, unconsolidated sand materials could cause "flowing ground" conditions during tunnel construction. Provisions for such a potential problem have been recognized in the tunnel construction and cost analyses (Jacobs Associates 1980). The tunnel

could be driven using a pressurized system to prevent groundwater infiltration into the tunnel.

- Possibility of Affecting Drilled Wells - According to Robinson, Noble & Carr, Inc., (see Appendix B), possibly 25 drilled wells within the study area are used for residential, institutional, and irrigation water supplies. Water from these wells is withdrawn from both upper and lower aquifers. Any lowering of the surfaces of aquifers (from use of dewatering wells) during tunnel construction could adversely affect yields from local wells and springs. Any effect on these wells should last only as long as construction dewatering is necessary for tunneling. Such dewatering is not anticipated.

Because the hydraulic relationships of the two aquifers is not clear, dewatering in the lower aquifer may also lower water levels in wells drilled in the upper aquifer (Appendix B). No long-term (post-construction) adverse impacts on groundwater resources is anticipated as a result of tunnel operation.

Mitigation of Potential Impacts on Groundwater

As previously mentioned, the use of air or dewatering wells during tunnel construction should eliminate any likely impacts of tunneling into "flowing ground" conditions (i.e., fine saturated sands or springs). A number of measures could be taken to more precisely determine or to prevent impacts on existing drilled wells:

- All local wells along the alignment should be inventoried prior to tunnel construction (see Appendix B for inventory parameters).
- Springs along the north side of Chambers Creek Valley (presently used as a water supply) should be located, their discharges estimated and their water quality determined using standard parameters.
- Future test borings should be completed with multiple piezometers in different aquifers encountered.
- Water level measurements from existing and future piezometers should be taken regularly and compiled to better define potentiometric surfaces, hydraulic gradients, and seasonal water level fluctuation.
- Hydraulic continuity between the upper and lower aquifers should be established for those areas which might require dewatering.

Implementation of the above recommendations would provide a data base from which to choose the best method of dewatering along the tunnel alignment. The inventory of local springs and wells would provide a record of discharges and quality in the event of conflict with local well owners during construction and after completion of the tunneling project.

Soils and Ground Stability

Present Conditions

The surficial soil formation within the Chambers Creek study area is classified as "upland sand and gravel", which includes three soil types: Vashon recessional outwash, Steilacoom gravel and Vashon advance outwash (EPA 1975). The Steilacoom gravel overlies stratified layers of nearly impermeable silts and sands. The gravelly surface soils tend to be of loose texture and generally unconsolidated.

The North Wall of Chambers Creek Canyon is considered unstable. There has been a history of slides along much of its length. Detailed soils investigations conducted by Hart-Crowser & Associates showed soils along the rim of the north Canyon to be Steilacoom gravels overlying layers of Colvos sand, Colvos transition sand and silt, and Kitsap formation (Hart-Crowser & Associates 1980).

The study area lies within the Puget Lowland, an area categorized as having a potential for high seismic activity. A discussion of seismic hazards was presented in Appendix D of EPA's 1976 EIS.

Recent data compiled by the USGS (Keuler pers. comm.) and the University of Puget Sound (Dames pers. comm.) indicate that no earthquake faults have been located within the study area.

The entire Puget Lowland area lies within what is known as a Zone 3 seismic risk category (high seismic activity area) and structures must therefore, be designed to withstand earthquakes of a moderate magnitude.

Impacts of the Alternatives

No-Action Alternative. Since no construction would occur, there would be no impact on soils within the study area.

Pump Station Alternative. For the most part, standard construction procedures would be anticipated along much of the pump station alignment; however, the combination of deep trench cuts (20-25 feet) and loose soil could create some difficult construction conditions, particularly where Chambers Creek Road begins its descent along the north side of Chambers Creek Canyon. It is anticipated that construction progress would be slow because of the deep trenches and the need to stabilize the slope. Construction would be most difficult wherever loose soil conditions are encountered. The interceptor would be constructed to conform to the specific design regulations of a Zone 3 seismic risk category (Tonkin pers. comm.).

Tunnel Alternative. Construction of the tunnel would be through Covos transition sands and silts for much of the alignment. The detailed soils surveys, both concluded and ongoing, are designed to provide enough information to anticipate potential tunnel construction problems. A detailed analysis by Jacobs Associates (1980) and Hart-Crowser & Associates highlighted a number of points: groundwater along approximately 2,200 feet of the 12,800 linear feet of tunnel could cause some construction problems, particularly where the alignment would jog south of Chambers Creek Road and also near the east end of the alignment. However, these problems would be controlled by specifying provisions for either the use of compressed air or earth balance tunneling technique along the entire alignment.

As shown on preliminary drawings, the tunnel alignment would pass within 30-35 feet of two residential structures and within 150 feet of another 16 structures, but at depths of 100-125 feet. However, because of the depth of the tunnel (100-150 feet below the surface) no problems of ground movement or settlement are likely to occur. The technique of using a tunnel shield followed by the erection of a primary support system and finally either a cast-in-place concrete lining or polyethylene pipe (with backfilling of concrete grout), would prevent ground loss problems. Impacts on the ground surface would only occur in the unlikely event of tunnel collapse. No vibration should be felt at the surface during tunnel construction because of the depth of the tunnel, the type of substrate and the method of tunnel boring. Jackhammering or blasting would be required if large boulders are encountered.

Surface Water Implications

Existing Conditions

The major surface waters within the study area are Chambers Creek and Leach Creek. Extensive data regarding surface water were presented in the 1975 Pierce County EIS (page III-23) and in the EPA EIS (page 57) and therefore will not be repeated here.

Neither alternative alignment will cross any watercourses and the alignments will, for the most part, be well away from Chambers Creek.

Impacts of the Alternatives

No-Action Alternative. The "no-action" impact on surface water quality was presented in the 1975 EIS prepared by EPA (page 96).

Pump Station Alternative. Construction of the pump station alignment would expose unprotected soil to potential erosion from rainfall and subsequent runoff into adjacent streamways. The inflow of sediments into Chambers Creek would cause temporary increases in turbidity and nutrients. Any fine silty-organic soil material would remain in suspension for a long period of time, and therefore cause the more turbid conditions in any surface waters. Such conditions would be temporary and would not adversely affect fisheries or beneficial uses of Chambers Creek.

The most likely impact of construction would occur along the lower part of Chambers Creek Road where the interceptor alignment would be close to Chambers Creek. Because the groundwater is far below the surface (60-75 feet) along this alignment, dewatering activities may not be necessary.

Tunnel Alternative. No impacts on surface water from tunneling are anticipated. Surface disturbance would only occur at the tunnel portals and if required, any groundwater encountered during construction would be discharged into the gravel company's existing holding ponds.

Mitigation of Potential Impacts on Surface Water Quality

For the Pump Station Alternative, the immediate backfilling and compaction of loose material into the excavated trench (particularly where steep slopes are involved) and repaving Chambers Creek Road would reduce water quality impacts. Other mitigation measures such as berming and installing haybales would reduce the inflow of sediments into Chambers Creek.

Terrestrial and Aquatic Resources

Existing Conditions

A detailed account of existing terrestrial and aquatic resources was presented in the 1975 EISs and will not be repeated here. The status of endangered and threatened wildlife species within the study area was updated and appears in Chapter 4 and Appendix C of this EIS.

Impacts of the Alternatives

Neither project alternatives would adversely affect terrestrial or aquatic resources in any major way. The locations of the inlet or pump station structures near Bridgeport Way would be in an abandoned gravel pit. Some vegetation, which has developed since abandonment of the gravel operation, would be cleared for either of those structures and for a construction staging area.

The remaining components of the alternatives (i.e., pipeline, tunnel, outlet structures, etc.), would either be located within existing roadways or well below the ground surface and would not affect terrestrial resources. Neither alternative would adversely affect aquatic resources.

Spoil Disposal

Impacts of the Alternatives

Construction of either alignment would necessitate the removal and disposal of soil material. Approximately 15,400 cubic yards of material from the Pump Station Alternative would require disposal, while, depending on the tunnel diameter, 13,400-27,000 cubic yards would be removed from the tunnel.

All excavated material not used as backfill would be disposed of at the Glacier Sand and Gravel operation. Material removed from the pump station alignment would be Steilacoom gravels and may be of some value as aggregate; however, it is anticipated that material excavated from the tunnel alignment would consist of fine silty-sand and would be of little value as aggregate. The material may be useful in stabilizing slopes or as fill.

No truck hauling on roadways would be required under the Tunnel Alternative.

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Transportation, Traffic Circulation and Utilities

Existing Conditions

The major roadways within the Chambers Creek study area include Chambers Creek Road, Grandview Drive, Bridgeport Way, and Cirque Drive. Bridgeport Way is a major four-lane artery running north and south while Chambers Creek Road runs westerly from Bridgeport Way, eventually terminating in Steilacoom, south of Chambers Creek. Figures 3-1 and 3-2 show the daily (24-hour) traffic volumes on the roadways within the study area.

Traffic currently is relatively light in the study area, with Chambers Creek Road having average daily traffic (ADT) between 3,200 and 4,150 (Figure 3-1). Traffic data indicate some through traffic uses Chambers Creek Road from the Town of Steilacoom and Bridgeport Way, and some through traffic uses Chambers Creek Road, 64th Street West and Grandview Drive. Other traffic uses Chambers Creek Road and 64th Street West as an access to Grandview Drive, although this pattern has the lowest volume of the through traffic. These through volumes are estimated to comprise nearly 70 percent of total traffic at the intersection of Chambers Creek Road. The remaining traffic is generated by land uses in the area, varying from residences to three major industries.

Truck traffic generated by the three major industries (Boise Cascade, Lone Star Industries, Inc., and Glacier Sand and Gravel) is of concern to area residents. These industries generate up to 525 trucks each weekday, representing 1,050 round trips, or an ADT of 1,050. About 90 percent of these trucks reportedly follow Chambers Creek Road to Bridgeport Way, although about 10 percent of them do exit to the Town of Steilacoom. As a result, about 25 percent of the traffic on Chambers Creek Road between 64th Street West and Bridgeport Way consists of heavy trucks. The truck traffic is heaviest between about 7 a.m. and 3 p.m., with the peak occurring in the morning.

Chambers Creek Road contains a number of utilities, a 10-inch water main and a 4-inch gas line. There is no existing sewer or storm drainage system within the roadway. Electricity, cable television, and telephone service is carried by overhead systems (Miranda; Gerdahl pers. comm.).

Impacts of the Alternatives

Pump Station Alternative. Construction of the Pump Station Alternative would require closure of Chambers Creek Road, since excavation for the sewer pipe and construction

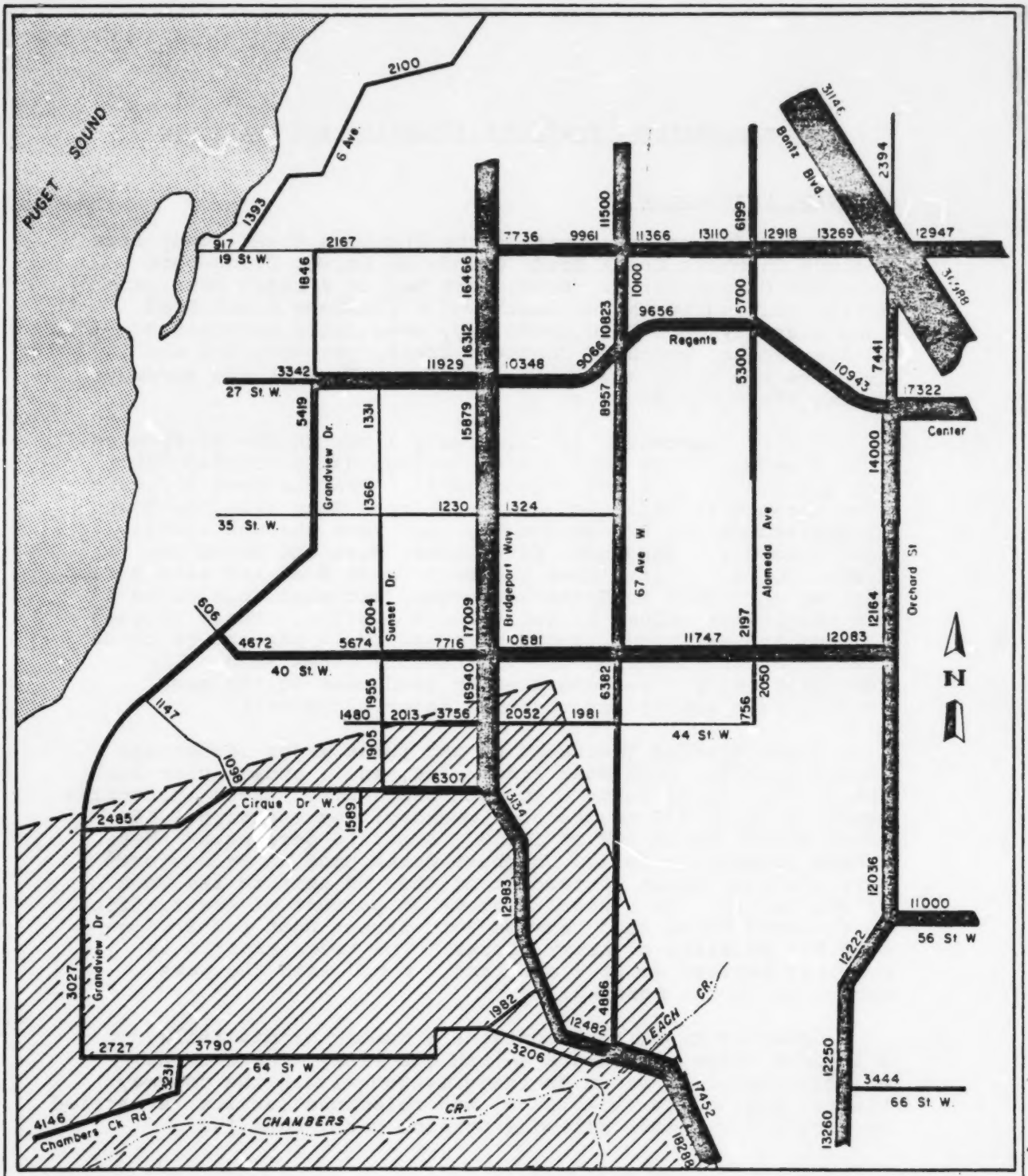
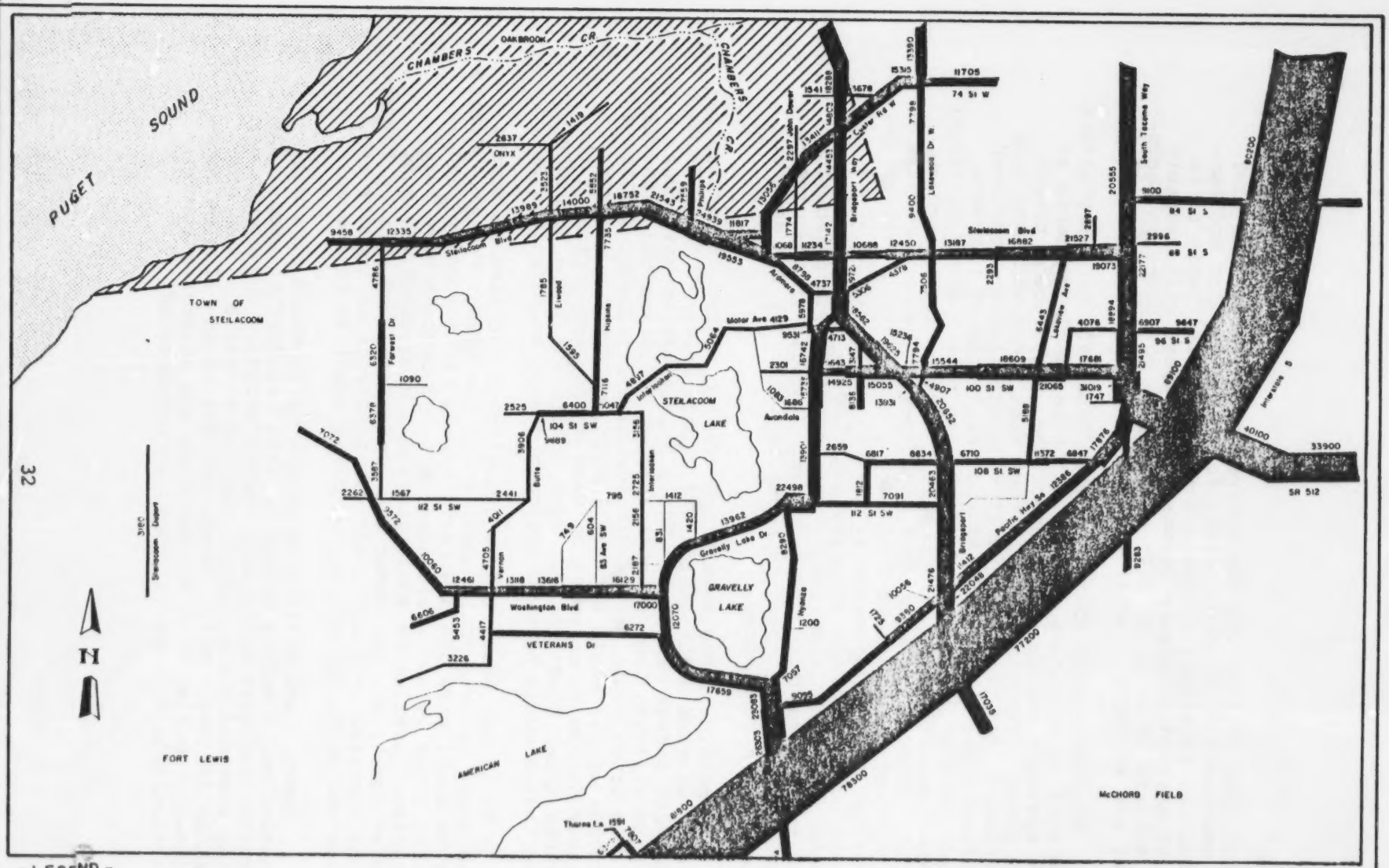


FIGURE 3-1. TRAFFIC FLOW MAP - CHAMBERS CREEK STUDY AREA



-LEGEND-

STUDY AREA

SCALE IN THOUSANDS

MODIFIED FROM: PIERCE COUNTY PUBLIC WORK DEPARTMENT, TRAFFIC ENGINEERING DIV.

NOTE: FIGURES REPRESENT 24 HOUR VOLUME

FIGURE 3-2. TRAFFIC FLOW MAP - SOUTH PORTION OF CHAMBERS CREEK STUDY AREA

activities will occupy the entire roadway area. It will be necessary to provide access for local traffic and construction vehicles, although this access is likely to be on an unpaved temporary roadway, and access will probably be subject to delay to give priority to construction equipment and activity. Local traffic will be inconvenienced.

The closure of Chambers Creek Road will probably affect the road in sections. Construction is likely to begin at the easterly end near Bridgeport Way, and proceed toward the plant. The closure will move west along with the pipe placement, and the trench will be backfilled and the road reconstructed behind it. As much as 1 mile of Chambers Creek Road could be closed at any one time. Three different detour situations will be possible during various stages of the closure. Condition 1 would occur when the closure is east of the Chambers Creek Road, 64th Street West intersection, with the intersection still open. Condition 2 would occur with the intersection closed, and Condition 3 would occur when the closure is west of the intersection, and the intersection has reopened. Impacts of the closure on traffic in the area are shown in Table 3-1 for each of these three conditions.

Condition 1 requires truck traffic to use either Steilacoom Boulevard or Grandview and Cirque Drives (or Grandview and 40th Street West). In Table 3-1 it was assumed that trucks visiting Lone Star Industries would use the Grandview-Cirque Drive route, while Glacier Sand and Gravel and Boise Cascade trucks would use Steilacoom Boulevard. However, either detour route could be used by any proportion of the trucks under Condition 1. With Conditions 2 and 3, however, the trucks would have no alternatives to these routings.

Table 3-1 shows that a significant increase in trucks and total traffic would occur along the detour routes. Cirque Drive would have 300 new heavy trucks per day under Conditions 1 and 2, and would have up to 80 percent more total traffic. Steilacoom Boulevard would have about 650 more heavy trucks per day under all conditions, and up to a 40 percent increase in total traffic. Little or no impacts are expected on Bridgeport Way or other roads in the area.

Heavy truck traffic on Cirque Drive would be a disruption and a safety hazard in this residential area. The traffic increase would also reduce safety. The trucks may also overload the pavement, leading to potholes and premature failure. Dust, debris and gravel may also be occasionally spilled from trucks using the alternate routes, particularly if rough pavement is encountered.

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Table 3-1. Predicted Impacts on Traffic Due to Construction of Pump Station Alternative With Various Road Closure Conditions

Condition 1 - Chambers Creek Road Closed From 64th Street West to Wright Academy Only

Location	Present Traffic-ADT	Change in Trucks-ADT	Change in Total Traffic-ADT	Resulting Traffic-ADT	Change in Total Traffic-%
Bridgeport Way @ Chambers Creek Road	12,500	0	+ 630	13,130	+ 5%
Steilacoom Boulevard west of Farwest	9,460	+650	+1,380	10,840	+15%
Steilacoom Boulevard east of Hopkins	18,750	+650	+1,380	20,130	+ 7%
Chambers Creek Road northeast of Steilacoom	4,150	+650	+ 120	4,270	+ 3%
Chambers Creek Road @ Wright Academy	3,790	-950	-3,350	440[1]	-88%
Grandview Drive north of 64th Street West	3,030	+300	+ 80	3,110	+ 3%
Cirque Drive east of Grandview	2,490	+300	+1,980	4,470	+80%

[1]Local traffic only, as permitted.

Condition 2 - Chambers Creek Road Closed From Chambers Bay to Wright Academy

Location	Present Traffic-ADT	Change in Trucks-ADT	Change in Total Traffic-ADT	Resulting Traffic-ADT	Change in Total Traffic-%
Bridgeport Way @ Chambers Creek Road	12,500	0	+3,020	15,520	+27%
Steilacoom Boulevard west of Farwest	9,460	+650	+3,770	13,230	+40%
Steilacoom Boulevard east of Hopkins	18,750	+650	+3,770	22,520	+20%
Chambers Creek Road northeast of Steilacoom	4,150	+650	-2,270	1,880	-55%
Chambers Creek Road @ Wright Academy	3,790	-950	-3,350	440[1]	-88%
Grandview Drive north of 64th Street West	3,030	+300	-2,320	710	-77%
Cirque Drive east of Grandview	2,490	+300	+1,350	3,840	+54%

[1]Local traffic only, as permitted.

Condition 3 - Chambers Creek Road Closed From Chambers Bay to 64th Street West Only

Location	Present Traffic-ADT	Change in Trucks-ADT	Change in Total Traffic-ADT	Resulting Traffic-ADT	Change in Total Traffic-%
Bridgeport Way @ Chambers Creek Road	12,500	0	+3,020	15,520	+27%
Steilacoom Boulevard west of Farwest	9,460	+650	+3,670	13,130	+39%
Steilacoom Boulevard east of Hopkins	18,750	+650	+3,670	22,420	+20%
Chambers Creek Road northeast of Steilacoom	4,150	+650	-2,370	1,780	-57%
Chambers Creek Road @ Wright Academy	3,790	-680	-1,930	1,860	-51%
Grandview Drive north of 64th Street West	3,030	0	-1,770	1,260	-42%
Cirque Drive east of Grandview	2,490	0	0	2,490	0

SOURCES: Pierce County Public Works Department, Traffic Engineering Division (Figures 3-1, 3-2, and unpublished); pers. comm. Boise Cascade Glacier Sand and Gravel, and Lone Star Industries, Inc.

Heavy truck traffic on Steilacoom Boulevard may have similar impacts. However, Steilacoom Boulevard has a higher percentage of truck traffic at present and may be able to handle the increased traffic more safely and with less threat to pavement than in the case of Cirque Drive.

The values shown in Table 3-1 do not include construction-generated traffic. At various times there will be truck-loads of pipe, pipe bedding materials, and related materials, as well as the passenger vehicles and pickup trucks of construction works. This traffic is likely to add up to 200 trips per day to the values shown in Table 3-1. These vehicles would use Chambers Creek Road from Bridgeport Way for the most part, although some would use the detour routes described above.

In the event the Pump Station Alternative was constructed, the utilities beneath Chambers Creek Road would be affected. Interruption of some utility services can be expected for brief periods of time wherever gas or water lines must be relocated. Since only two utility lines are within the road-way, the anticipated impact of construction would not be severe.

Tunnel Alternative. The Tunnel Alternative would not cause any road closures, and would not require detouring of any trucks from Chambers Creek Road. Tunnel operations would generate some construction-related traffic, mostly of tunnel construction materials and workers. This traffic, perhaps 200 trips per day, would use Chambers Creek Road, increasing traffic levels by about 5 percent. No signifi-cant impacts are expected.

No impact on utilities would result from tunnel con-struction because the alignment would be well below the lo-cation of utilities.

Mitigation Measures

- Inconvenience to local traffic along Chambers Creek Road can be relieved by providing a gravelled access road along the construction area, allowing continuous access for local traffic. If this is not feasible, local traffic can be passed at regular intervals, with the schedules made available to residents in advance, and clearly posted at both ends of the closure. Since an access road can, from a practical standpoint, be located on only one side of the excavation, crossings will be necessary to permit access to homes and land on the opposite side of the pipe alignment. There should be clearly marked

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crossings wherever necessary, and when not practical to provide a crossing, arrangements should be made with each affected party to satisfy their access needs until a crossing can be provided.

- A traffic management plan for traffic diversion and control should be prepared. The plan should indicate the alternative routes during construction and the means of informing the public of the availability and locations of those routes.

- Traffic impacts on Cirque Drive could be mitigated by designating alternate routes, such as 40th Street West as the temporary access route from Lone Star Industries to Bridgeport Way. This would increase traffic on Grandview Drive and on 40th Street West. During Condition 1, all truck traffic could be detoured through Steilacoom, if Pierce County and town officials can reach an agreement on such a routing. This would increase the impact on Steilacoom and Steilacoom Boulevard. This mitigation would not be effective under Conditions 2 or 3.

- The impacts on detour routes could also be mitigated by minimizing the duration of the closure, or by providing through passage for trucks during construction. Segments under construction should be opened to traffic as much as possible during off-construction hours.

- Access to all homes should be maintained, especially during off-construction hours.

- Precautions should be taken to forewarn fire departments of rerouted vehicle access.

- No utility should be left disconnected overnight.

Noise

Existing Conditions

An extensive "noise impact" analysis was prepared by Robin M. Towne & Associates, Inc., as a part of the 1975 Pierce County EIS on Chambers Creek U.L.I.D. 73-1 (Volume 2, Appendix D). The study consisted of noise measurements at six locations within the sewer service area, noise predictions from construction and facility operation, and suggestions for mitigating construction noise.

Impacts of the Alternatives

Pump Station Alternative. The construction of this alternative would cause temporary noise impacts along much of its alignment. Since the alignment would follow the existing Chambers Creek Road, the noise impact is expected to affect residents along the route, primarily from the intersection of Bridgeport Way to the point where Chambers Creek Road swings south to enter the Canyon, a distance of approximately 12,000 feet. The construction activities would include excavation, earth moving, compacting, paving and cleanup. The typical noise levels expected along the route are as follows:

	Leq, dBA*	
Phase of Construction	A[1]	B[2]
Ground clearing	84	84
Excavation	88	78
Foundations (pipe laying)	88	88
Finish	84	84

The Occupational Safety and Health Administration (OSHA) requires noise control measures for certain construction equipment. Substantial reductions in noise can be achieved when using equipment with noise controls; for example, a backhoe without controls would average 85 dBA at 50 feet, while one with controls would emit noise levels of approximately 75 dBA. Comparable reductions can be achieved for pavers, cranes, generators, and jackhammers.

Noise generated by operation of the pump station on Bridgeport Way would be insignificant due to the isolated location of the facility. Noise levels of any aboveground facilities would be approximately 41-46 dBA at 50 feet (Pierce County 1975).

Tunnel Alternative. Noise impacts created by construction of the tunnel would be highly localized. A majority of the work effort would be carried out at the tunnel portal location on the Glacier Sand and Gravel property, well away from

*Leq dBA - decibels described as equivalent noise level. This is the average of the noise energy within a stated period of time.
[1]All pertinent equipment present at site.
[2]Minimum required equipment present at site.

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residential areas. Some construction activity would also occur at the eastern terminus of the tunnel near Bridgeport Way, a location also isolated from residential areas. The nearest residence is approximately 600 feet away, and on the west side of Bridgeport Way.

Some additional truck traffic would occur on Chambers Creek Road, transporting necessary supplies and equipment to the tunnel construction staging area.

Mitigation of Noise Impacts

Use of construction equipment containing noise control devices would reduce noise levels 6-18 dBA in the work and immediate impact areas.

Land Use

Present Conditions

Existing land use within the study area is a mixture of single-family residential (although several multifamily units occur in the area), open space, institutional (education), commercial, and mining (EPA 1975; field observations 1980). Development is scattered along Chambers Creek Road from Bridgeport Way west to the New Tacoma Cemetery. Major commercial enterprises include a greenhouse and nursery complex, a cemetery and mortuary and two sand and gravel companies, Lone Star Industries, Inc., and Glacier Sand and Gravel. Boise Cascade operates a pulp and paper facility on the south side of Chambers Bay.

Land use immediately above the tunnel alignment is a mix of residential, open space and road rights-of-way. Several structures lie near the alignment.

Chambers Creek Canyon, a focal point of the study area, is a major open space and important natural area (EPA 1975; Pierce County 1975).

Chambers Creek Road functions as a travel route for local residents and commercial (truck) traffic from the sand and gravel operations and Boise Cascade. Included within the road right-of-way are water and natural gas transmission lines.

Impacts of the Alternatives on Land Use

Pump Station Alternative. The alignment for this alternative would be primarily within the existing Chambers Creek

Road right-of-way. Approximately 570 feet at both ends of the proposed alignment would not be within existing rights-of-way (Table 3-2). That 570 feet of alignment would be on land which supports or has supported sand and gravel extraction operations. The proposed pump station would also be located on land where gravel and sand extraction has been terminated. While the construction of those project facilities would preclude any future alternative uses of those sites, the land area needed would be relatively small (probably no more than 2 acres).

Proper screening, sound proofing and odor control at the pump station would effectively prevent any adverse impacts on future use of the surrounding land.

Since neither construction nor permanent easements on private property would be required, no impairment of existing uses of residential or commercial property is anticipated.

Tunnel Alternative. The localized nature of tunnel construction would minimize the impacts on land use. Construction and permanent subsurface easements would be required at the tunnel entrance and terminus and wherever the tunnel would pass beneath private property. Of the 14,700 feet of alignment (including extension of the Bridgeport Interceptor), approximately 51 percent would be located on county-owned property while 20 percent would lie on land owned by gravel and sand enterprises and the remaining 29 percent on other private property. Construction easements for portals, staging and work areas (3-4 acres) would be required on both ends of the tunnel alignment.

The tunnel alignment would pass immediately adjacent to (within 35 feet) two residential structures. Another 16 structures would lie within 150 feet on either side of the tunnel centerline (most are located along Chambers Creek Road). The siting of any of these project facilities and structures would not adversely affect future use of land surrounding them.

Business Disruption

Existing Conditions

A number of commercial and industrial operations are located within the study area, Lone Star Industries, Inc., (sand and gravel extraction), Glacier Sand and Gravel, Boise Cascade (pulp and paper), the New Leaf (nursery-garden center) and Brookside Mortuary. On a daily basis, the two sand and

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gravel operations and Boise Cascade receive and ship products by truck. Virtually all truck traffic uses Chambers Creek Road for those shipments even though alternate routes are available. These alternate routes are not used because of traffic congestion, stoplights and complaints from area residents (Larsen, Nelson & Martz pers. comm.).

Impact of the Alternatives

Pump Station Alternative. Based on existing alignment profile and soils information, an estimated 10,000 feet of Chambers Creek Road would be closed to through traffic for construction of the gravity pipeline. Wherever the trench depth would be 20 feet or greater virtually the entire roadway would be required to achieve a 1:1 slope of the trench walls (a 1:1 slope would be needed because of loose soils).

The resultant road closure would cause a definable disruption of present operations of several of the establishments. In all cases, vehicles entering and leaving the facilities would have to follow alternate routes. In some cases, such interference could produce lost production time (because of delays) and a loss in customers because of difficult access. Additionally, partial and total losses of access as well as general disturbance caused by construction would discourage potential customers and result in a loss of sales.

At a construction progress rate of 25-50 feet per day, portions of the road would be closed during a 40-80 week period. Because of the varied nature of the businesses, the projected disruption of their operations would vary considerably.

Tunnel Alternative. The tunneling alternative would avoid construction in Chambers Creek Road, thereby avoiding any disruption of adjacent businesses.

Energy Usage

Of the alternative conveyance projects evaluated by this Supplemental EIS, only the Pump Station Alternative would require energy for its operation. This energy would be required for operation of pumps and for heating, lighting and ventilation of the pumping station. In the Tunnel Alternative, there would be no energy usage since wastewater flow is by gravity and no buildings would be required.

Two forms of energy would be used at the pumping station. The primary source, electricity, was assumed to be available and used 360 days per year. For the remaining 5 days of the year power outages were assumed, with diesel engine-driven generators being used to generate electricity on-site.

Table 3-2. Existing Land Use Along Alignments of Project Alternatives

	Existing Land Use	Project Feature: Pump Station/Tunnel Invert/Exit	Project Feature: Pipeline Alignment (feet)
Pump Station Alternative	Roadway right-of-way		
	- Bridgeport Way		480
	- Chambers Creek Road		13,600
	Gravel pit	± 2 acres	570
	Residential/open space		
	TOTALS	± 2 acres	14,650*
Tunnel Alternative	Roadway right-of-way		
	- Bridgeport Way		480
	- Chambers Creek Road		4,170
	Gravel pit	± 2 acres	1,420
	Residential/open space		
	- private ownership		±5,850**
	- county ownership		±2,780**
	TOTALS	± 2 acres	14,700*

NOTES:

* 650 feet of the total length would include extension of the existing Bridgeport Interceptor.
**Preliminary estimates only.

Estimated electrical energy requirements in the year 2000 would be 6,222,300 kilowatt hours per year, which would cost $63,500 per year at the 1979 calculated average rate of $0.0091 per kilowatt hour. Diesel fuel requirements in year 2000 would be 9,900 gallons per year, and would cost $6,900 per year at an average cost in 1979 of $0.701 gallons of diesel fuel (Table 3-3).

To determine the sensitivity of the Pump Station Alternative to future energy cost escalations, Table 3-4 was prepared for annual energy cost escalations of 3, 5, and 7 percent greater than the general inflation rate for other project components. As shown, a compounded annual escalation rate of 5 percent would increase the energy costs by $105,000 per year to a year 2000 cost of $168,500 per year, which would be 11 percent of the total annual cost of the project. Similarly, if energy costs increase annually at a 7 percent greater rate than other project components, energy costs in year 2000 would be $245,700, or 16 percent of the total annual project cost.

Although EPA does not presently require the use of an electrical energy escalation factor in the cost-effectiveness analysis of the facilities planning process, a proposed rate regarding energy escalation has been published by EPA in the November 3, 1980 Federal Register. Using this proposed rule, energy costs would approximately double between 1980 and year 2000, which is equivalent to a compounded annual escalation rate of about 3.5 percent. The impact of a 3.5 percent annual electrical energy cost increase upon total annual project costs would be to increase them by about 9 percent, as shown in Table 3-4.

Project Costs

Since the EPA EIS was prepared in 1975, rather large escalations have occurred in the cost of constructing and financing projects similar to the alternatives covered by this Supplemental EIS. To illustrate the impact of these cost escalations, Table 3-5 was prepared showing the costs which were estimated in 1975 for the North Canyon Wall Alternative and the Pump Station Alternative, and the costs which are estimated in 1980 for the Pump Station Alternative and the Tunnel Alternative. As shown, substantial cost escalations have occurred. In the case of the Pump Station Alternative, the only one of three alternatives for which cost estimates were made in both 1975 and 1980, a 71 percent cost increase has occurred. It should be expected that similar cost increases have also occurred in other alternatives.

Table 3-3. Energy Usage in Year 2000 and Energy Cost for the Pump Station Alternative

	Kw-hr/yr	Gallons/yr	$/yr
Electrical Energy	6,222,300[1]		56,600[3]
Diesel Fuel		9,900[2]	6,900[4]
			63,500/yr

[1]Assumes electrical energy usage 360 days per year.

[2]Assumes diesel fuel-powered generator usage 5 days per year.

[3]Based on an average electrical charge of $0.0091/kw-hr.

[4]Based on $0.70 per gallons of diesel fuel.

Table 3-4. Energy Costs in Year 2000 at Various Annual Energy Escalation Rates

	Energy Escalation Rate			
	0%	3.5%	5%	6.5%
Annual energy cost	$ 63,500- Per Year	$ 126,400- Per Year	$ 168,500- Per Year	$ 223,800- Per Year
Annual costs excluding energy[1]	$1,315,900	$1,315,900	$1,315,900	$1,315,900
Total Annual Cost	$1,379,400	$1,442,300	$1,484,400	$1,539,700
Energy Cost as a Percentage of Total Annual Cost	5%	9%	11%	15%

[1]Includes amortized capital costs and annual O&M costs.

Table 3-5. Comparison of Project Costs in 1975 and 1980

Alternative Concept	Based on 1975 EIS[1]			Based on 1980 Kennedy Engineering Report[2]			
	Initial Project Cost ($)	Annual O&M Cost ($)	Total Annual[3] Cost ($)	Initial Project Cost ($)	Annual O&M Cost ($)	Total Annual[3] Cost ($)	Percentage Increase in Total Annual Cost Between 1975 and 1980 (%)
Gravity Interceptor on North Canyon Wall	5,235,000[4]	359,000/yr	857,900/yr				
Pump Station Alternative	6,427,500[4]	139,000/yr	751,600/yr	11,407,000	199,800/yr	1,379,500/yr	71
Tunnel[5]				14,550,000	36,600	1,238,800/yr	

[1]Final Environmental Impact Statement for Chambers Creek Sewerage System (ULID 73-1) Project #C-530565-01, Pierce County, Washington, prepared by Wiley & Ham Inc., and EPA Region 10, December 1975.

[2]Cost Effective Analysis of the Chambers Creek Interceptor Alternatives, Pierce County, Washington, prepared by Kennedy Engineers, July 1980.

[3]Capital costs amortized at 7 1/8 percent and 20 years.

[4]Capital costs presented in the 1975 EPA EIS were increased by 25 percent to provide allowance for design cost, construction management, administration, sale of bonds, soils investigations, and land and easements.

[5]Tunnel with a concrete pipe.

Estimated 1980 capital costs for the alternatives which are considered in this Supplemental EIS, range from $11.4 million for the Pump Station Alternative to $16.3 million for the tunnel with the polyethylene pipe liner, as shown in Table 3-6. Annual operation and maintenance costs vary widely, from $2,500 per year for the polyethylene pipe tunnel concept to $199,800 per year for the Pump Station Alternative (Table 3-7). To determine which of the three alternatives has the lowest overall cost, taking both initial capital costs and annual costs into consideration, the project alternative can be compared on the basis of their present worth. Present worth in this case is the amount of money which would have to be available at the present time to construct the project and operate it over a 20-year period. The comparison based upon present worth is shown in Table 3-8. Overall, the least costly alternative is use of tunnel with a concrete pipe. This concept is 9 percent less costly than the Tunnel Alternative with the polyethylene pipe, and is 11 percent less costly than the Pump Station Alternative.

Table 3-6. Capital Cost of Alternative Projects

	Tunnel With Concrete Pipe	Tunnel With Polyethylene Pipe	Interceptor With Pump Station Alternative
Material and Equipment	12,359,900	13,910,400	9,779,100
Soils Investigation	355,000	355,000	40,000
Design, Construction Management and Bond Sale	1,651,000	1,857,600	1,459,600
Land and Easements	184,100	184,100	128,300
	14,550,000	16,307,100	11,407,000

Table 3-7. Annual Operation and Maintenance Cost of Alternative Projects

	Tunnel With Concrete Pipe	Tunnel With Polyethylene Pipe	Interceptor With Pump Station Alternative
Energy Cost	0	0	$63,600/yr
Maintenance Cost	$36,600/yr	$2,500/yr	$77,800/yr
Operations Cost	0	0	$58,400/yr
	$36,600/yr	$2,500/yr	$199,800/yr

Table 3-8. Present Worth Analysis of Alternative Projects

	Tunnel With Concrete Pipe	Tunnel With Polyethylene Pipe	Interceptor With Pump Station Alternative
Present Worth of Initial Capital	14,549,900	16,307,000	11,407,000
Present Worth of Future Equipment Replacement	0	0	3,641,300
Present Worth of Salvage Value	-1,936,100	-2,171,000	-2,670,800
Subtotal	12,613,800	14,136,000	12,377,500
Present Worth of Operations and Maintenance	383,600	26,200	2,096,100
TOTAL	12,997,400	14,162,200	14,473,600
Percent Increase Over Lowest Cost Alternative		9%	11%

NOTE:

Interest rate = 7 1/8 percent, time period = 20 years.

Chapter 4

COORDINATION AND CONSULTATION

Introduction

This chapter summarizes the public participation and agency coordination and consultation requirements for EIS preparation.

Public Participation

The public participation program for this Supplemental EIS includes the following elements:

- Scoping Meeting - A scoping meeting was held in the offices of Pierce County Department of Public Works. This meeting was attended by 11 representatives of federal, state and local agencies, and citizen groups. Concern was expressed regarding energy costs, impacts on archeological features, erosion control, and easement requirements. The outline and schedule for the project were presented.

- Public Hearing - A public hearing to solicit oral comments on this Draft Supplemental EIS will be held by EPA at the Chamber of the Board of Pierce County Commissioners, Room 1046, County-City Building, Tacoma, Washington.

Individuals or groups who wish to comment on the EIS may forward written comments to:

U. S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101
Attention: Clark Smith

Agency Coordination and Consultation

Introduction

Various federal laws and executive orders address specific environmental concerns which must be recognized when preparing an EIS. This section summarizes the impacts of the project alternatives on those resources defined by law or executive order.

Historical and Archeological Resources

EPA is subject to requirements of Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470) and Executive Order 11593, May 13, 1971, which require an inventory of historic and prehistoric resources of the study area and a determination of impact on those resources.

The Final EIS for Chambers Creek sewerage system (ULID 73-1) prepared by EPA in 1975, contained an "interim cultural resource assessment ...". Based on the results of that resource assessment and letters of comment from the Advisory Council on Historic Preservation (November 14, 1975) and the Washington State Parks and Recreation Commission (October 6, 1975), the following grant condition was defined by EPA:

> "The County shall provide assurances that key contractor personnel associated with excavation during construction of the project will undergo an orientation course from a qualified archeologist on identification of archeological resources. If an archeological site is found during construction, the excavations involved will be delayed, the State Office of Archeology and Historic Preservation and the Washington Archeological Research Center will be notified, and arrangements will be made with a qualified archeologist to either detour around the site or excavate the site. This course of action will also be followed if the archeological survey reveals the presence of an archeological site on the interceptor route."

That 1975 EIS included an evaluation of the "Pump Station Alternative" described in this Supplemental EIS, but did not include an evaluation of the "Tunnel Alternative".

To ensure compliance, the most recent listing of the National Register of Historic Places was consulted (Federal Register, 44 No. 20, February 6, 1979; Federal Register Vol. 45, No. 54, March 18, 1980). Additionally, prehistoric and historic aboriginal sites and sites qualifying for nomination as historic places were reviewed.

A representative of the Washington SHPO attended the scoping meeting held December 4, 1980. SHPO then reviewed the project alternatives based on information provided by Kennedy/Jenks Engineers, Inc. The results of the SHPO review appears in Appendix D of this EIS.

Wetlands, Floodplains, and Agricultural Lands

Executive Order (11990 and 11988) and EPA policy require that the impact of a proposed action on these environmentally-sensitive resources be evaluated.

An impact analysis of the "Pump Station Alternative" was conducted in the 1975 EIS.

Using the inventory data available from that document, it was determined that no part of the "Tunnel Alternative" would impact wetlands, floodplains or agricultural lands.

Coastal Zone Management

The Coastal Zone Management Act (16 U.S.C. 1451) requires that all federal activities in coastal areas be consistent with approved state coastal zone management programs.

Analysis of the "Pump Station Alternative" with respect to the "Pierce County Shoreline Management Plan" was made in the 1975 EPA EIS and in the 1975 EIS prepared by Pierce County. According to those statements, "the Alternative C (Pump Station Alternative) Chambers Creek Interceptor alignment would be entirely in public right-of-way on roads outside the Chambers Creek Canyon and the tentatively designated 'natural environment' area."

The tunnel alignment, which was not evaluated in the 1975 documents, would not be within the jurisdiction of the Shoreline Management Plan.

Endangered Species

"Under the Endangered Species Act (16 U.S.C. 1531), federal agencies are prohibited from jeopardizing threatened or endangered species or adversely modifying habitats essential to their survival" (Federal Register, Vol. 44, No. 216). An evaluation of the "Pump Station Alternative" was conducted in the 1975 EIS.

Appendix C contains a letter from the U. S. Fish and Wildlife Service indicating the existence of endangered or threatened wildlife or plant species within the study area.

Aside from the tunnel portal sites, all construction activity for the "Tunnel Alternative" would be below ground and there would be no impact on endangered or threatened species.

LIST OF PREPARERS

Responsible Agency and Technical Consultants

Region 10 of EPA was responsible for preparing this EIS. Technical assistance to EPA was provided under a contract with Jones & Stokes Associates, Inc., of Sacramento, California. Jones & Stokes Associates is a multidisciplinary firm of biologists, planners, environmental specialists, and engineers.

Jones & Stokes Associates utilized the services of several subcontractors. Culp-Wesner-Culp analyzed project energy projections and project costs. Robinson, Noble & Carr, Inc., assessed the probable impacts of project alternatives on groundwater resources.

Region 10 - EPA Staff

- EIS Preparation Coordinator - Roger Mochnick, Environmental Evaluation Branch.
- Project Monitor - Clark Smith, Environmental Evaluation Branch.
- Project Engineer - Cecil Carroll, Construction Grants.

Jones & Stokes Associates Inc.

- Program Director - Dr. Charles Hazel, Vice President.
- Project Manager - Jonathan Ives, Manager of Jones & Stokes Associates, Seattle Office.
- Traffic Engineer - Curtis Spencer, P.E., Environmental Engineer.

Subcontractors to Jones & Stokes Associates, Inc.

- Culp-Wesner-Culp - Robert Gumerman, Ph.D., P.E., analyzed project costs and energy requirements.
- Robinson, Noble & Carr, Inc. - John Noble, President, and Mackey Smith, Hydrogeologist, analyzed the possible impacts on groundwater resources.

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Tonkin, David. Miscellaneous dates. Kennedy/Jenks Engineers, Tacoma. Telephone conversations.

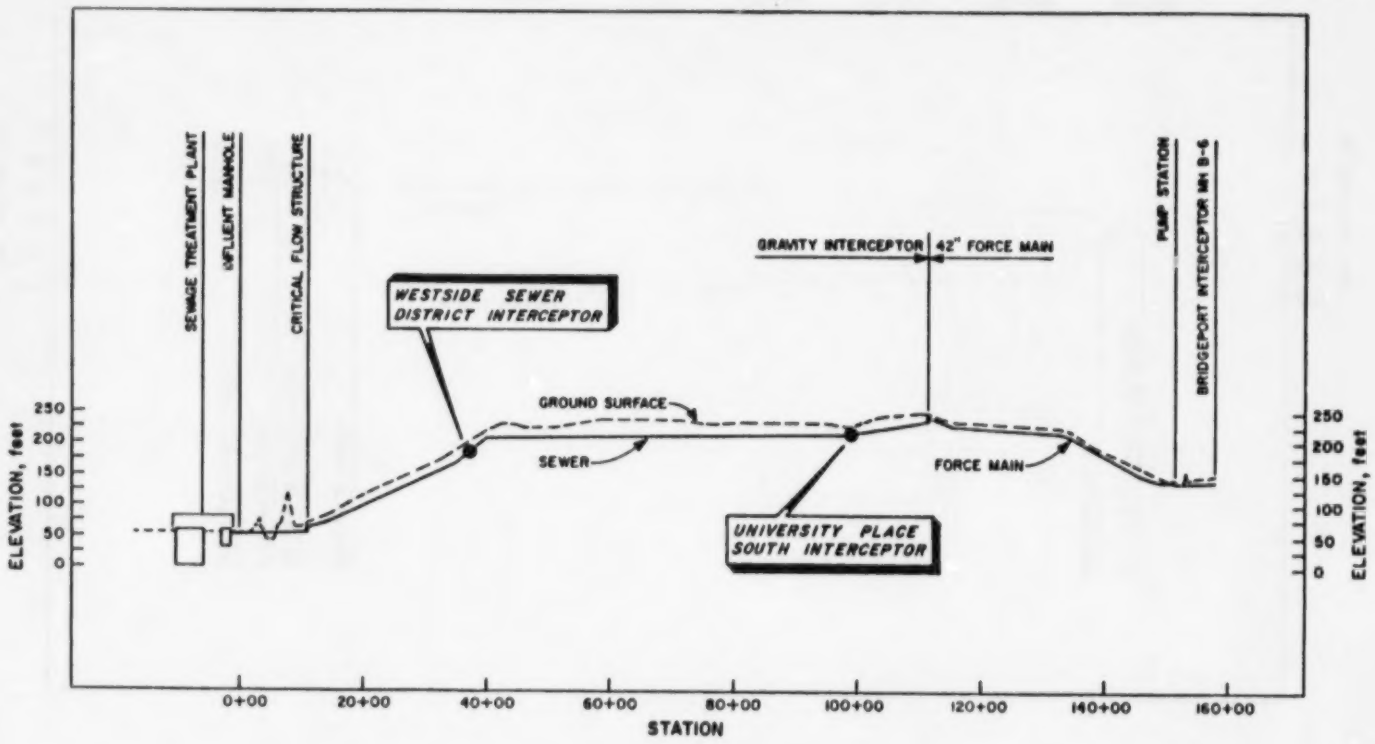
Appendix A

- PROFILES OF PUMP STATION AND TUNNEL ALTERNATIVES

- DESIGN FLOWS FOR YEAR 2000 - PUMP STATION AND TUNNEL ALTERNATIVES

03 61

FIGURE A-1

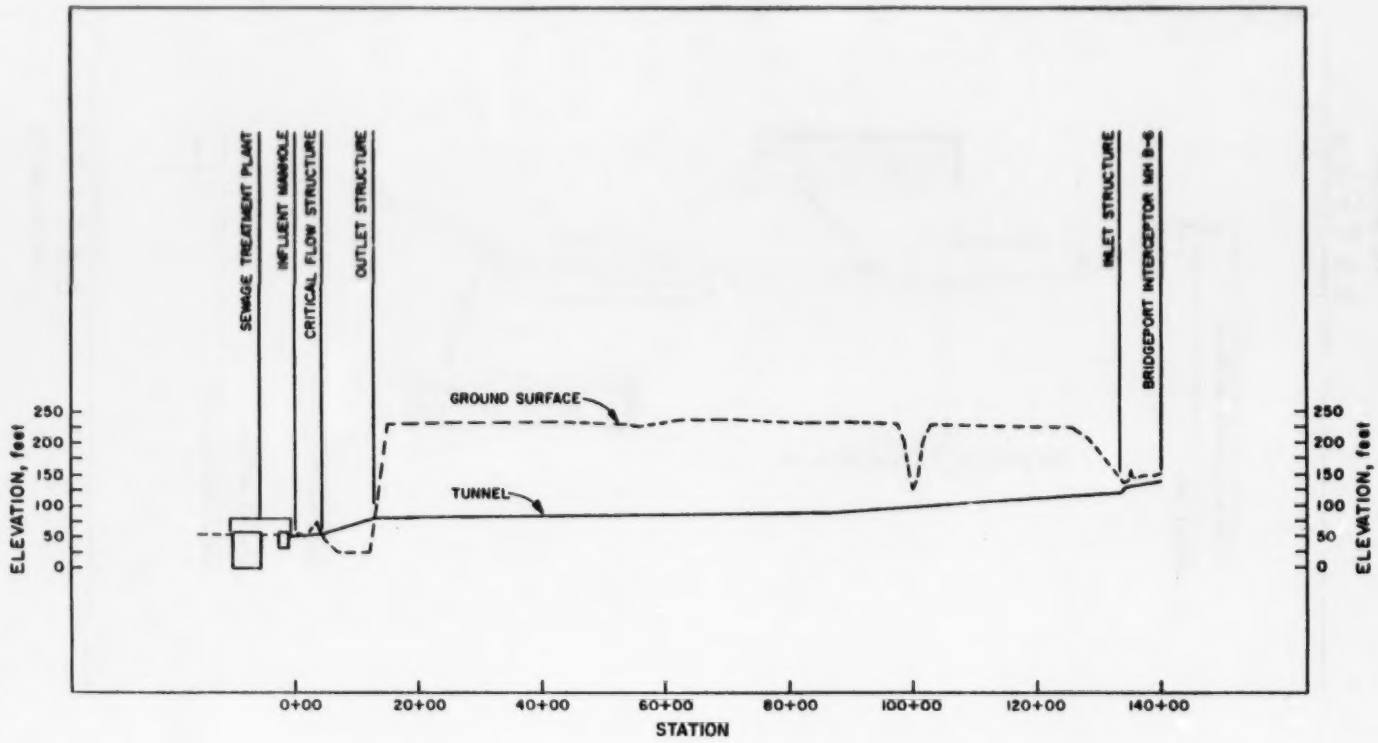


SCALES
HORIZ 1"=2000'
VERT 1"= 200'

PROFILE

PIERCE COUNTY ULID 73-1
CHAMBERS CREEK INTERCEPTOR
PUMP STATION/FORCE MAIN ALTERNATIVE
FROM: KENNEDY ENGINEERS JUNE 1980

FIGURE A-2



SCALES:
HORIZ 1"=2000'
VERT 1"= 200'

PROFILE

PIERCE COUNTY ULID 73-1
CHAMBERS CREEK INTERCEPTOR
TUNNEL ALTERNATIVE
FROM: KENNEDY ENGINEERS JUNE 1980

63
09
60

FIGURE A-3

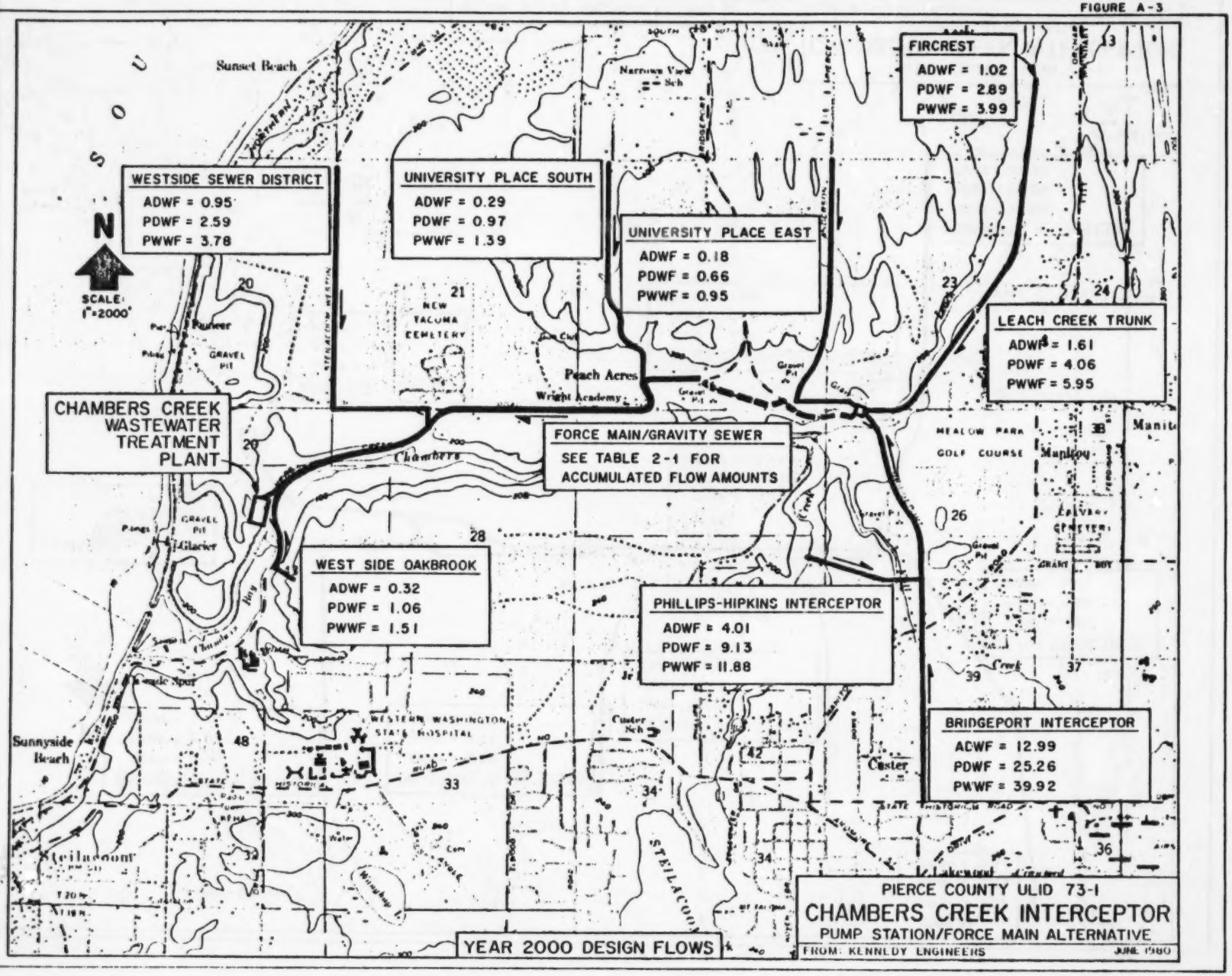
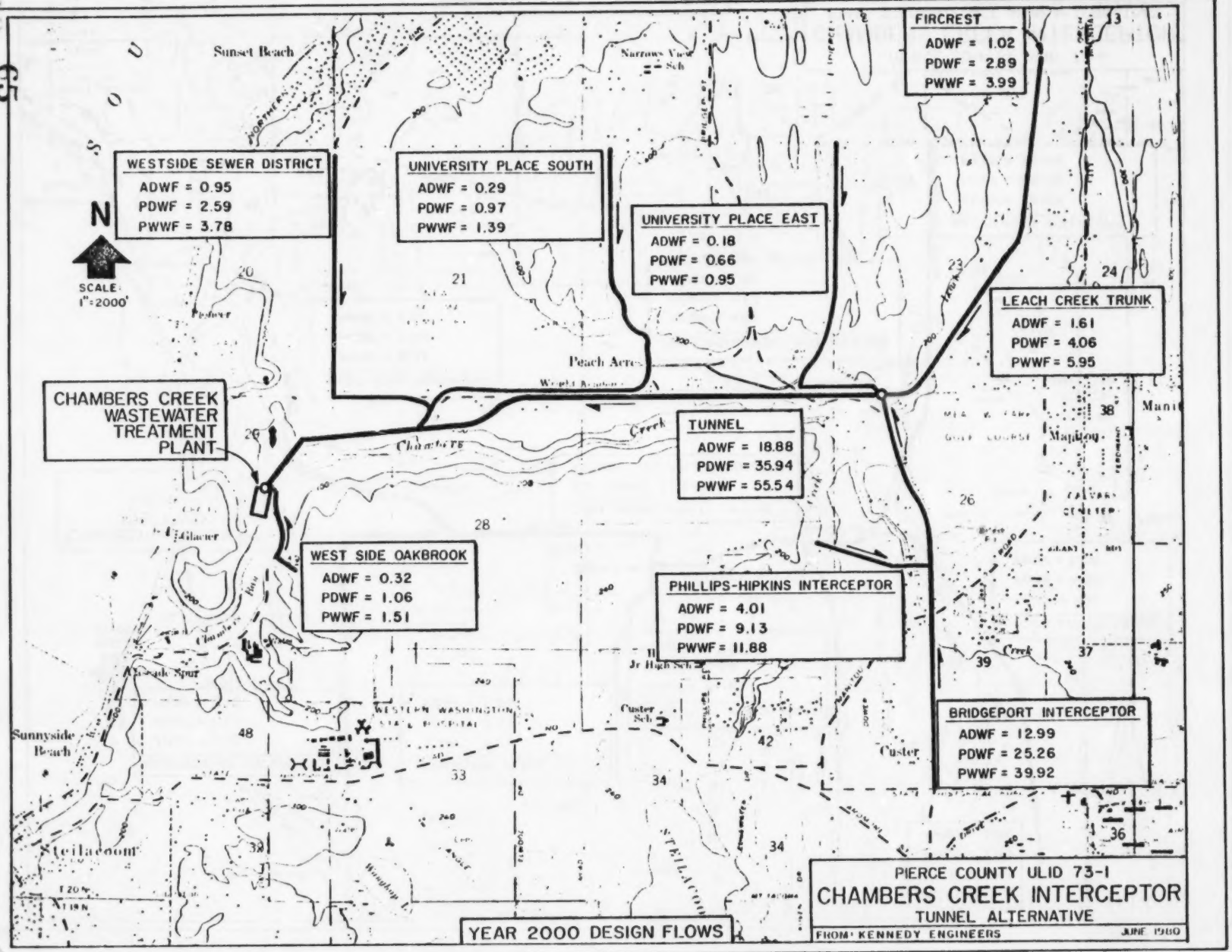

WESTSIDE SEWER DISTRICT
ADWF = 0.95
PDWF = 2.59
PWWF = 3.78
UNIVERSITY PLACE SOUTH
ADWF = 0.29
PDWF = 0.97
PWWF = 1.39
UNIVERSITY PLACE EAST
ADWF = 0.18
PDWF = 0.66
PWWF = 0.95
FIRCREST
ADWF = 1.02
PDWF = 2.89
PWWF = 3.99
LEACH CREEK TRUNK
ADWF = 1.61
PDWF = 4.06
PWWF = 5.95
CHAMBERS CREEK WASTEWATER TREATMENT PLANT
FORCE MAIN/GRAVITY SEWER
SEE TABLE 2-1 FOR ACCUMULATED FLOW AMOUNTS
WEST SIDE OAKBROOK
ADWF = 0.32
PDWF = 1.06
PWWF = 1.51
PHILLIPS-HIPKINS INTERCEPTOR
ADWF = 4.01
PDWF = 9.13
PWWF = 11.88
BRIDGEPORT INTERCEPTOR
ADWF = 12.99
PDWF = 25.26
PWWF = 39.92
N
SCALE: 1"=2000'
Sunset Beach
Peach Acres
Wright Academy
NEW TACOMA CEMETERY
GRAVEL PIT
Chambers
Glacier
Eagle Spur
Sunnyside Beach
WESTERN WASHINGTON STATE HOSPITAL
Steilacoom
Custer
Custer Sch
Manitou
MEADOW PARK GOLF COURSE
Lakewood
STEILACOOM
YEAR 2000 DESIGN FLOWS
PIERCE COUNTY ULID 73-1
CHAMBERS CREEK INTERCEPTOR
PUMP STATION/FORCE MAIN ALTERNATIVE
FROM: KENNEDY ENGINEERS
JUNE 1980

FIGURE A-4


FIRCREST
ADWF = 1.02
PDWF = 2.89
PWWF = 3.99
WESTSIDE SEWER DISTRICT
ADWF = 0.95
PDWF = 2.59
PWWF = 3.78
UNIVERSITY PLACE SOUTH
ADWF = 0.29
PDWF = 0.97
PWWF = 1.39
UNIVERSITY PLACE EAST
ADWF = 0.18
PDWF = 0.66
PWWF = 0.95
LEACH CREEK TRUNK
ADWF = 1.61
PDWF = 4.06
PWWF = 5.95
CHAMBERS CREEK WASTEWATER TREATMENT PLANT
TUNNEL
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WEST SIDE OAKBROOK
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PDWF = 1.06
PWWF = 1.51
PHILLIPS-HIPKINS INTERCEPTOR
ADWF = 4.01
PDWF = 9.13
PWWF = 11.88
BRIDGEPORT INTERCEPTOR
ADWF = 12.99
PDWF = 25.26
PWWF = 39.92
N
SCALE: 1"=2000'
Sunset Beach
Peach Acres
Chambers Creek
Glacier
Steilacoom
Sunnyside Beach
Custer
Custer Sch
Jr High Sch
Maplelou
YEAR 2000 DESIGN FLOWS
PIERCE COUNTY ULID 73-1
CHAMBERS CREEK INTERCEPTOR
TUNNEL ALTERNATIVE
FROM: KENNEDY ENGINEERS
JUNE 1980

Appendix B

POTENTIAL IMPACTS OF PROJECT ALTERNATIVES ON GROUNDWATER

By:

Robinson, Noble & Carr, Inc.

ROBINSON, NOBLE & CARR, INC.
GROUND WATER & ENVIRONMENTAL GEOLOGISTS
5915 ORCHARD STREET WEST
TACOMA, WASHINGTON 98467
(206) 475-7711

80-59

December 22, 1980

JONES & STOKES ASSOCIATES, INC.
105 South Main Street
Suite 203
Seattle, WA 98104

Attention: Jonathan H. Ives

Subject: Potential impact on ground water from construction of the Chambers Creek Interceptor

Gentlemen:

In response to your letter of December 5, 1980, we have reviewed the Hart/Crowser report entitled "Preliminary Report on Phase II Geotechnical Engineering Study and Recommendations for Phase III and IV Investigations, Proposed Chambers Creek Interceptor Tunnel, Pierce County, Washington", dated July, 1980. We have also reviewed information on the ground water hydrology of the Chambers Creek area from published literature and from Robinson, Noble & Carr, Inc. company files.

We understand that two alternative methods for routing for the Chambers Creek Interceptor are being considered. The first method is by pump station, force main, and gravity pipe to the proposed treatment facility located near Chambers Bay. The second alternative for the proposed interceptor is via tunnel beneath the upland on the north side of Chambers Creek Valley.

Barring rupture of the force main or gravity line, the pump station-force main-gravity pipe alternative should have no effect on ground water in the Chambers Creek area. Operation of the tunnel alternative should also have no effect on ground water unless catastrophic rupture of the tunnel occurs. We assume the concrete liner (about 56-inch diameter) will be formed directly against the mined ground. If so, an impermeable seal will exist between natural ground and the tunnel exterior. If a tunnel liner was run in by other means, an exterior conduit could possibly exist. In that case, exterior grouting rings should be placed at intervals, and especially against silt-clay zones where a tight seal can be effected.

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During construction of the tunnel, serious impact on ground water in the Chambers Creek area could occur. Analysis of data from the above-referenced Hart/Crowser report indicates the existence of two separate aquifers in the proposed tunnel area. The upper aquifer, occurring in Hart/Crowser's "Colvos sand", has a potentiometric surface ranging in elevation from about 155 to 170 feet above sea level. Water within this aquifer is perched upon older less permeable deposits described in the Hart/Crowser report as: "Colvos transitional sand and silt; Colvos silt-clay; Kitsap upper gravel; and Kitsap silty sand".

A lower aquifer system exists in layers of sand or sand and gravel complexly interbedded with the older less permeable finer grained deposits. Potentiometric surfaces in this lower aquifer range from about 90 to 120 feet above sea level. The hydraulic gradient of this potentiometric surface along the tunnel alignment slopes generally from east to west. The potemtiometric surface of the lower aquifer appears to represent the regional water table, below which all sediments are saturated.

The proposed grade of the tunnel invert is below the upper aquifer for the entire length of the alignment. The tunnel invert is below the potentiometric surface of the lower aquifer for the western 7,000 feet of the proposed project. Stratigraphic and water level information from test borings 1A and 7 do not sufficiently define the vertical limits of the aquifers at the eastern end of the proposed tunnel.

When boring the tunnel, fine sand layers may be encountered in the older sediments in the lower aquifer. This condition may cause flowing ground. Potential flowing ground conditions will presumably require control by either air pressure within the tunnel or by lowering the potentiometric surface of the lower aquifer through dewatering wells.

Washington Water Supply Bull. 22 entitled Ground Water Occurrence and Stratigraphy of Unconsolidated Deposits, Central Pierce County, Washington, 1968, lists 6 wells drilled prior to 1960 along the tunnel alignment. They were for residential, institutional and irrigation water supplies. While information on wells drilled in the area from 1960 through the present time is available from several sources, it is not presented in published form. Budget and time constraints of this review have prevented acquisition of this later well data.

Robinson, Noble & Carr, Inc. records indicate the presence of at least 3 additional wells along the tunnel alignment. The total number of wells anticipated to exist along the alignment may reach 25. With the exception of wells drilled to supply the New Tacoma Cemetery, Charles Wright Academy and Sunrise Terrace Mobile Home Park, most are expected to be of relatively small diameter and low yield designed to supply single family residences. Inventory and testing of all potentially affected wells is essential prior to tunnel construction and dewatering.

Water Supply Bull. 22 also notes two springs along the northern wall of the Chambers Creek Valley. Spring No. 20/2-22P1s is located in a small ravine just north of the tunnel alignment and east of Charles Wright Academy. Discharge from the spring was estimated at 400 gpm. A smaller spring, 20/2-22D1s, is listed as discharging about 25 gpm and is located just east of the tunnel entry. Numerous other springs exist along the northern valley side of Chambers Creek. These springs and seeps should be located and their discharges estimated prior to tunnel construction. Water samples should be collected and tested from the springs and wells.

Water from local wells drilled along the proposed tunnel alignment is withdrawn from both upper and lower aquifers. The upper aquifer yields water to spring 20/2-22P1s, while the hydrologic relationship of the aquifers to spring 20/2-26D1s is uncertain.

Any attempt to lower the potentiometric surface in the lower aquifer to minimize flowing ground conditions during tunnel construction could result in lower water levels in local wells. The effects of dewatering procedures on the local wells should only last as long as construction dewatering is necessary for tunneling. Dewatering the lower aquifer may also lower water levels in wells completed in the upper aquifer. The hydraulic relationship between the two aquifers is not clearly presented in the Hart/Crowser report, and should be determined by extensive hydrologic testing prior to tunnel construction.

Conclusions

- Assuming complete structural integrity of the pump station-force main-gravity pipe, this alternative should have no effect on local ground water during either construction or operation.

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- The tunnel alternative will impact ground water only during the construction phase, barring an unforseen catastrophic breaching of the tunnel during operation.

- Two separate aquifers exist in the area of the tunnel alignment. The hydraulic relationship between these two aquifers has not been clearly defined.

- Local wells are completed in both aquifers.

- Springs discharge where the land surface intercepts the aquifer along the steep northern side of Chambers Creek Valley.

- Intentional (through dewatering wells) or accidental (by encountering flowing ground) lowering of potentiometric surfaces of aquifers during tunnel construction may adversely affect yields from local wells and springs.

Recommendations

- All local wells along the tunnel alignment should be inventoried prior to tunnel construction. Inventory should include:

  Location
  Depth
  Altitude
  Aquifer elevation
  Inlet elevation
  Depth to water
  Well yield
  Specific capacity
  Use
  Water quality
  Depth to pump inlet
  Type of pump
  Driller's log

- Springs along the north side of Chambers Creek Valley should be located, their discharges should be measured, and their water quality determined.

- Future test borings should be completed with multiple piezometers in different aquifers encountered.

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- Water level measurements from existing and future piezometers should be taken regularly and compiled to better define potentiometric surfaces, hydraulic gradients, and seasonal water level fluctuations.

- Hydraulic continuity between the upper and lower aquifers should be established through hydrologic testing.

Implementation of the above recommendations will provide a data base from which to choose the best method of dewatering along the tunnel alignment. The inventory of local springs and wells will provide a record of discharges and quality in the event of conflict with local well owners during construction and after completion of the tunneling project.

Respectfully submitted,

ROBINSON, NOBLE & CARR, INC.

Mackey Smith

Mackey Smith

John B. Noble

John B. Noble

McS:JBN/in

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Appendix C

ENDANGERED AND THREATENED WILDLIFE

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF GAME
600 North Capitol Way, GJ-11 Olympia, WA 98504 206/753-5700

RECEIVED
FEB 9 1981
ENVIRONMENTAL EVALUATION
BRANCH

Mr. Clark H. Smith
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Dear Mr. Smith:

We have completed a review of our files for information on significant natural features in the study area. The result of this review is presented in the following enclosures:

Enclosure 1 summarizes the occurrence of special plants, animals, and plant communities reported within or adjacent to the study area.

Enclosure 2 is a summary of national and statewide status of special animals reported to occur within the study area.

In order to ensure the protection of the special species and plant communities occurring in the study area, we recommend that the specific locational information presented here not be published or distributed. If general information is distributed, please provide the Nongame Program with a draft of any document in which information from the Natural Heritage Data System is incorporated or referenced.

If your office should publish or distribute any of the information presented here, please cite the Natural Heritage Data System as follows:

Natural Heritage Data System
Washington Natural Heritage Program and
Department of Game - Nongame Program
c/o The Evergreen State College
3109 Seminar Building, TA-00
Olympia, Washington 98505

I hope this presentation will be useful to you. More detailed locational information from our files can be made available for site planning purposes. If you have further questions or concerns about special animals, please feel free to contact me at (206) 754-1449 or SCAN 8-235-1449.

Sincerely,

THE DEPARTMENT OF GAME

Kelly R. McAllister

Kelly R. McAllister
Wildlife Biologist

Enclosures

Enclosure 1

ELEMENT OCCURRENCE SUMMARY

Introduction

This enclosure summarizes the element occurrences reported within or adjacent to the study area and catalogued in the Natural Heritage Data System. An "element" is a natural feature of particular interest because it is exemplary, unique, or endangered on a statewide or national basis. An element can be a plant community, plant species, or special animal.

The Natural Heritage Data System was established by the State of Washington and the Natural Heritage Program of The Nature Conservancy. It is currently maintained by the Natural Heritage Program and by the Nongame Program of the Washington Department of Game. Information on plant and animal occurrences in the state is gathered from various sources. Through historical data, scientific literature, field observations, and herbarium and museum species, the Natural Heritage Data System is establishing a base from which to work in evaluating Washington's natural features.

The Element Occurrence summary table lists those plant communities, special plants, and special animals that have been reported to the sources listed above to occur in the area specified in your information request.

- The first column lists the U.S. Geological Service (USGS) topographic quadrangles.

- The second column lists the township, range, and section.

- The third column entitled "CONF." (confirmation) lists a code indicating the specificity of the locations recorded for each element occurrence.

Confirmation Codes

C Means the location of the element occurrence is known within a ¼ mile radius. In addition, the locality has been confirmed by the Nongame Program or the Washington Natural Heritage Program.

U Means the location of the element occurrence is known within a ¼ mile radius, but at this time, has not been confirmed.

N Means the location of the element occurrence is known within a 1 mile radius. This information was derived from secondary sources.

G Means the location of the element occurrence is not known within a 1 mile radius. The element occurrence is locatable only to a general area, usually denoted by a geographic name. This information was derived from secondary sources.

- The fourth column indicates the element's class, i.e. "PC" means plant community, "SP" means special plant, and "SA" means special animal.

- In the fifth column, the element is named. For animals, both scientific and common name is given, followed by letter codes that indicate the criteria used by data system personnel in determining whether a location is biologically/

ecologically significant to the species. The following are definitions for these criteria codes.

Element Occurrence Criteria for Special Animals

IO Individual occurrence. Any record of the species constitutes a special animal occurrence.

HC Herptile concentration. Five or more individuals present in the same location.

HO Haul out area for marine mammals.

CR Colonial roosts.

B Evidence of breeding: nest, young or eggs, adult visiting probable nest site, nest building activity (i.e. carrying nest material), breeding display, agitated behavior and distraction display (e.g. feigning injury).

RI Regular individual occurrences at same location. Observations of less than 10 individuals that have been made during at least 3 different years, not necessarily consecutive.

RSC Regular small concentrations, 10-70 individuals, in the same location during any season for 3 years, not consecutive necessarily.

RLC Regular large concentrations, during migration, breeding or winter seasons, of over 70 individuals, that have been made during at least 3 different years (not necessarily consecutive).

NOTE: Observations that meet criteria established for a special animal species are mapped and pertinent information is stored in a computerized file.

- The seventh column is the occurrence number which can be referred to when making inquiries about a specific occurrence for which more information is desired.

Comments

The enclosed information represents the reported element occurrences currently catalogued in the Natural Heritage Data System. The Data System is constantly updated as more current and historic information on element occurrences in the state are reported. Consequently, some of the element occurrences reported to occur historically within the study area may no longer be present. Likewise, areas within the study boundary for which element occurrences have not yet been reported may, nevertheless, support plant communities or special plant or animal species.

Finally, if additional information is needed on specific animal occurrences within the study area, please contact the Washington Department of Game, Nongame Program. If plant communities or special plants occur within the study area, you will be receiving a separate response from the Washington Natural Heritage Program.

ELEMENT OCCURRENCE SUMMARY

Quad Name		T	R	S	Conf.	Element Occurrences		
						Class	Name	Number
Steilacoom	7.5	20N	2E	27	G	SA	Charina bottae (rubber boa)	055
Steilacoom	7.5	20N	2E	27	G	SP	Arenaria paludicola	003
Steilacoom	7.5	20N	2E	27	N	SA	Thomomys mazama tacomensis (western pocket gopher)	005
Steilacoom	7.5	20N	2E	22	U	SA	Thomomys mazama tacomensis (western pocket gopher)	012
Steilacoom	7.5	20N	2E	22	U	SA	Charina bottae (rubber boa)	046
Steilacoom	7.5	20N	2E	21	U	SA	Thomomys mazama tacomensis (western pocket gopher)	015
Steilacoom	7.5	20N	2E	20	U	SA	Thomomys mazama tacomensis (western pocket gopher)	014
Steilacoom	7.5	20N	2E	21	N	SA	Sciurus griseus (western gray squirrel)	028
Steilacoom	7.5	20N	2E	21	N	SA	Butorides striatus (green heron)	007
Steilacoom	7.5	20N	2E	21	N	SA	Thomomys mazama tacomensis (western pocket gopher)	006
Steilacoom	7.5	20N	2E	*	G	SP	Woodwardia fimbriata	015
Steilacoom	7.5	20N	2E	*	U	SA	Sciurus griseus (western gray squirrel)	019
Steilacoom	7.5	20N	2E	*	U	SA	Sciurus griseus (western gray squirrel)	027
Steilacoom	7.5	19N	2E	*	N	SA	Charina bottae (rubber boa)	046
Steilacoom	7.5	20N	2E	*	U	SA	Thomomys mazama tacomensis (western pocket gopher)	011

* Reported to occur in the general area of the project.

Enclosure 2

ELEMENT STATUS SUMMARY

Element Name	Element Status	
	Federal	State
Charina bottae (rubber boa)		C
Thomomys mazama tacomensis (western pocket gopher)		C
Sciurus griseus (western gray squirrel)		C

C - Species of Concern. Active data collection in progress to better understand the species' status in Washington.

NOTE: The Washington Department of Game's Nongame Program's species list will, upon completion, include status information for each species. Status information for individual species can now be obtained by contacting the Nongame Program.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

January 15, 1981

Mr. Joseph Blum
Area Manager
U.S. Fish and Wildlife Service
2625 Parkmont Lane
Olympia, Washington 98502

Dear Mr. Blum:

In accordance with Section 7 (C) of the Endangered Species Act of 1973, we are requesting information on the existence of endangered or threatened wildlife species or critical habitats in the vicinity of Chambers Creek, Pierce County, Washington.

The EPA is in the process of preparing a Supplemental Environmental Impact Statement on alternative interceptor alignments for the conveyance of wastewater from the Bridgeport Interceptor (under construction) to the wastewater treatment plant near Chambers Creek (the treatment plant is to be constructed beginning June, 1981). A map of the study area and a brief description of the project alternatives is enclosed.

Sincerely yours,

/s/

Clark H. Smith
Project Officer

Enclosure

Appendix D

HISTORIC AND CULTURAL RESOURCES

STATE OF WASHINGTON

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 West Twenty First Avenue, M S KL-11, Olympia, Washington 98504 206/753-4011

KENNEDY/JENKS ENGINEERS, INC. TACOMA

FEB 3 1981

January 30, 1981

Mr. Roy H. Peterson
Pierce County Public Works
3551 Bridgeport Way West
Tacoma, WA 98466

Log Reference: 202-C-PI-12

Project Title: Chambers Creek
Interceptor Tunnel U.L.I.D. 73-1
K/J 4077

Dear Mr. Peterson:

The project plans for the Chambers Creek Interceptor Tunnel were presented to us by Mr. David Tonkin of Kennedy/Jenks Engineers and reviewed by our staff. Our comments are as follows:

Excavation of the interceptor tunnel will occur well below the depth at which we would expect to encounter cultural deposits. All ground surface disturbance related to this project (excavation for drop structures, gravity sewers and road easement) will occur in previously disturbed terrain. In addition, the project is not located in a high potential cultural resource area. In view of these conditions, we do not anticipate that this portion of the Chambers Creek Project will affect significant cultural resources.

Despite its unlikelihood, the possibility does exist that unanticipated cultural remains may be encountered during project construction. In this event, work in the immediate vicinity should be discontinued and this office immediately notified.

If you have any questions, please call me at (206) 754-2856.

Sincerely,

Carol Kielusiak

Carol Kielusiak
Coastal Reviewer

db

cc: David Tonkin

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Appendix E

DISTRIBUTION LIST

FEDERAL AGENCIES

Council on Environmental Quality

U. S. Department of Agriculture, Region 10

U. S. Department of Agriculture, Soil Conservation Service

U. S. Department of Defense, Department of the Army

U. S. Department of Interior, Bureau of Outdoor Recreation

U. S. Department of Interior, Fish and Wildlife Service

U. S. Department of Transportation, Region 10

Health and Human Services, Region 10

Health and Human Services, Public Health Service

U. S. Department of Housing and Urban Development, Region 10

U. S. Department of Commerce, National Marine Fisheries Service

Advisory Council on Historic Preservation

MEMBERS OF CONGRESS

Henry M. Jackson, U. S. Senate

Slade Gorton, U. S. Senate

Don Bonker, U. S. House of Representatives

Floyd V. Hicks, U. S. House of Representatives

STATE AGENCIES

Governor of Washington

Office of Program Planning and Fiscal Management

Department of Ecology

Department of Fisheries

Department of Game

Department of Highways

Department of Natural Resources

Parks and Recreation Commission

Department of Social and Health Services

Office of Community Development

REGIONAL AND LOCAL AGENCIES

Puget Sound Governmental Conference

Puget Sound Air Pollution Control Agency

Pierce County

Town of Steilacoom

Westside Water District

INTERESTED GROUPS

Washington Environmental Council

Sierra Club

Friends of the Earth

The League of Women Voters

Tahoma Audubon Society

Concerned Citizens of Pierce County, Inc.

Lakewood Sewer and Water Committee

Washington Air Quality Coalition

INTERESTED INDIVIDUALS

H. A. Bringolf

Edward Burkhalter

William P. Giddings

Edward A. Newton

Joann B. North